1979

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INTERNATIONAL PACIFIC SALMON
FISHERIES COMMISSION

APPOINTED UNDER A CONVENTION
BETWEEN CANADA AND THE UNITED STATES FOR THE
PROTECTION, PRESERVATION AND EXTENSION OF
THE SOCKEYE AND PINK SALMON FISHERIES
IN THE FRASER RIVER SYSTEM

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ANNUAL REPORT

1979

COMMISSIONERS

DONALD R. JOHNSON
WILLIAM G. SALETIC
GORDON SANDISON

W. R. HOURSTON
RICHARD A. SIMMONDS
ALVIN W. DIXON

NEW WESTMINSTER
CANADA
1980

INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION

MEMBERS AND PERIOD OF SERVICE SINCE THE INCEPTION OF THE COMMISSION IN 1937

CANADA

William A. Found	1937-1939
A. L. Hager	1937-1948
Senator Thomas Reid	1937-1967
A. J. Whitmore	1939-1966
	1968-1969
Olof Hanson	1948-1952
H. R. MacMillan, C.B.E., D.Sc.	1952-1956
F. D. Mathers	1956-1960
W. R. Hourston	1960-
Richard Nelson	1966-1976
Roderick Haig-Brown	1970-1976
Richard A. Simmonds	1976-
Alvin W. Dixon	1978-

UNITED STATES

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B. M. Brennan	1937-1942
Charles E. Jackson	1937-1946
Fred J. Foster	1943-1947
Milo Moore	1946-1949
	1957-1961
Albert M. Day	1947-1954
Alvin Anderson	1949-1950
Robert J. Schoettler	1951-1957
Elton B. Jones	1951-1957
Arnie J. Suomela	1954-1961
DeWitt Gilbert	1957-1974
George C. Starlund	1961-1966
Clarence F. Pautzke	1961-1969
Thor. C. Tollefson	1966-1975
Charles H. Meacham	1969-1970
Donald R. Johnson	1971-
William G. Saletic	1974-
Donald W. Moos	1975-1977
Gordon Sandison	1977-

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DIRECTOR — A.C. COOPER

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REPORT OF THE INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION FOR THE YEAR 1979

The 1979 Fraser River sockeye run was the third largest in the cycle since 1899, bringing the average run for the years 1976-79 to 6.51 million sockeye, or 63% of the 10.25 million average in the period 1894 to 1916. In the years following the Hell's Gate obstruction from 1917 until the return in 1949 following completion of the fishways, the average run was 3.4 million sockeye. Under the Commission's rehabilitation and management, the sockeye runs have nearly doubled, and further growth in stock size is anticipated.

The 1979 Fraser River pink salmon run was the largest since 1947, and at 14.1 million pinks perhaps half of the historical run size. The trend in growth of the pink salmon stock continues (Figure 1) and the record number of spawners in 1979 provides the potential for further growth.

The problems in management of the stock are also increasing year by year because of such developments as growth of fisheries in waters outside of the Convention area, growth in the west coast troll fishery, the separate Indian commercial fisheries in United States Convention Waters under regulation by the United States government starting in 1977, the growth in Indian fisheries along the Fraser River in Convention Waters under regulation by the Canadian government, and the changing practices in delivery and sale of fish with the attendant problems of obtaining accurate catch records quickly. These developments are indicative of the intense competition for a very valuable food resource.

The waters of the Fraser River system are a major natural resource of the Province of British Columbia, and the sockeye and pink salmon are dependent upon a suitable environment in the river and its many tributaries and lakes used by these fish for migration, spawning and rearing of young. The preservation of this environment for protection of the sockeye and pink salmon is a major concern of the Commission and foremost among these concerns is the spectre of hydroelectric power developments. Of particular concern is the announcement by the Aluminum Company of Canada at the end of 1979 that it intended to proceed with a second phase of its existing diversion of water from the Nechako River, including diversion from Nanika Lake in the Skeena River system into the Nechako reservoir.

Previous investigation of the Nechako diversion by B.C. Hydro and Power Authority was reported in the Commission's 1976 Annual Report. Some of the foreseeable effects of the diversion on the environment were reviewed and it was concluded that the diversion constituted a substantial threat to the maintenance of productive stocks of sockeye and pink salmon, which are the backbone of the Fraser River commercial fishery for salmon. In view of the current proposal by Alcan, the effects of the diversion on Fraser River sockeye and pink salmon are to be reviewed in more detail in a report to be prepared in 1980. It should be emphasized that the effects would not be limited to the Nechako River system, (Figure 2) but would also extend to the Fraser River downstream to its estuary. Following is a list of concerns the Commission perceives on the basis of present knowledge and there could be others still not recognized:

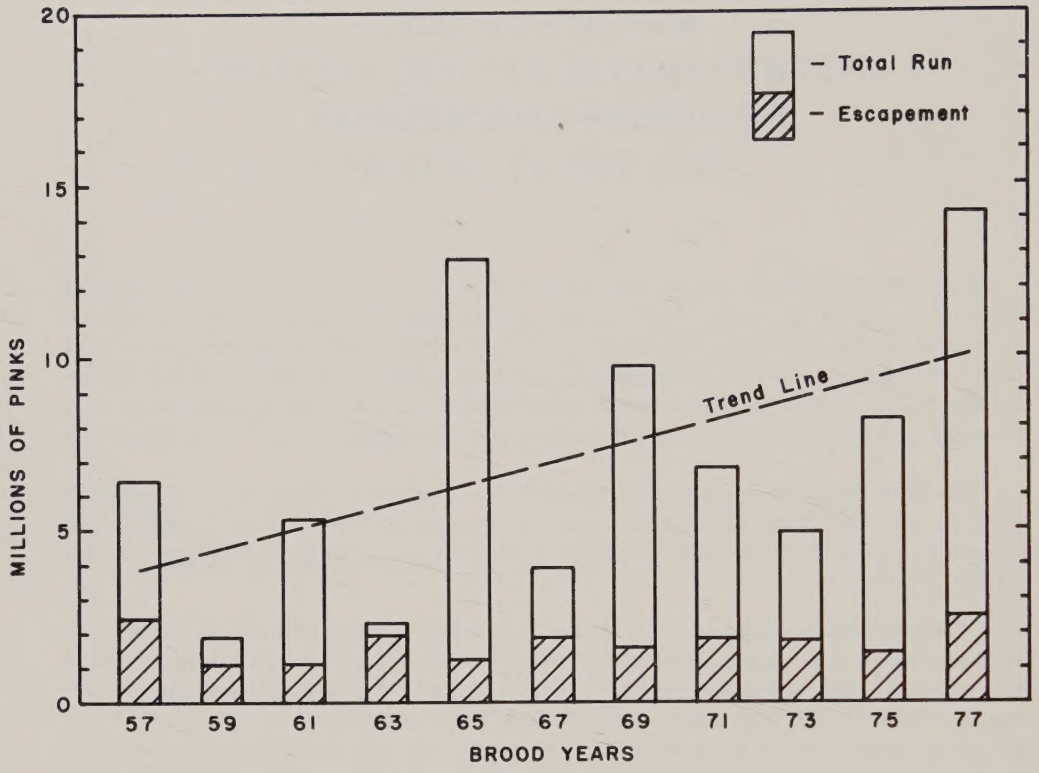

Figure 1. Fraser River pink salmon total runs and escapements, by brood years.

1. Insufficient discharge in the Nechako River for the adult sockeye migrations up the river between the Stuart and Nautley Rivers.

2. During the period of adult sockeye migrations up the Nechako River, the temperature of the reduced river flow will at times exceed the acceptable level of 68°F., with consequent adverse effects on the survival and reproduction of the runs affected.

3. Associated with the increased temperature of the Nechako River, substantial differences in temperatures would be created at the confluence with the Stuart River and with the Fraser River, which could result in delay of the adult migrations with consequent reduction in the success of spawning of fish that do reach the spawning grounds.

4. Reduced discharge in the Fraser River, particularly between Prince George and Quesnel would result in increased concentrations of waste effluents discharged to the river after treatment, thereby reducing the safety factor provided by dilution now and in the future.

5. During the period of migration of summer run sockeye stocks up the Fraser River (which include the Nechako system stocks) water temperatures in the Fraser River will be increased with possible adverse effects on utilization of the fishes body energy stores and on success of spawning of some major sockeye stocks.

6. Reduced discharge in the Fraser River downstream from Hope in the late summer and fall will result in increased demand for dredging in the large pink salmon spawning grounds

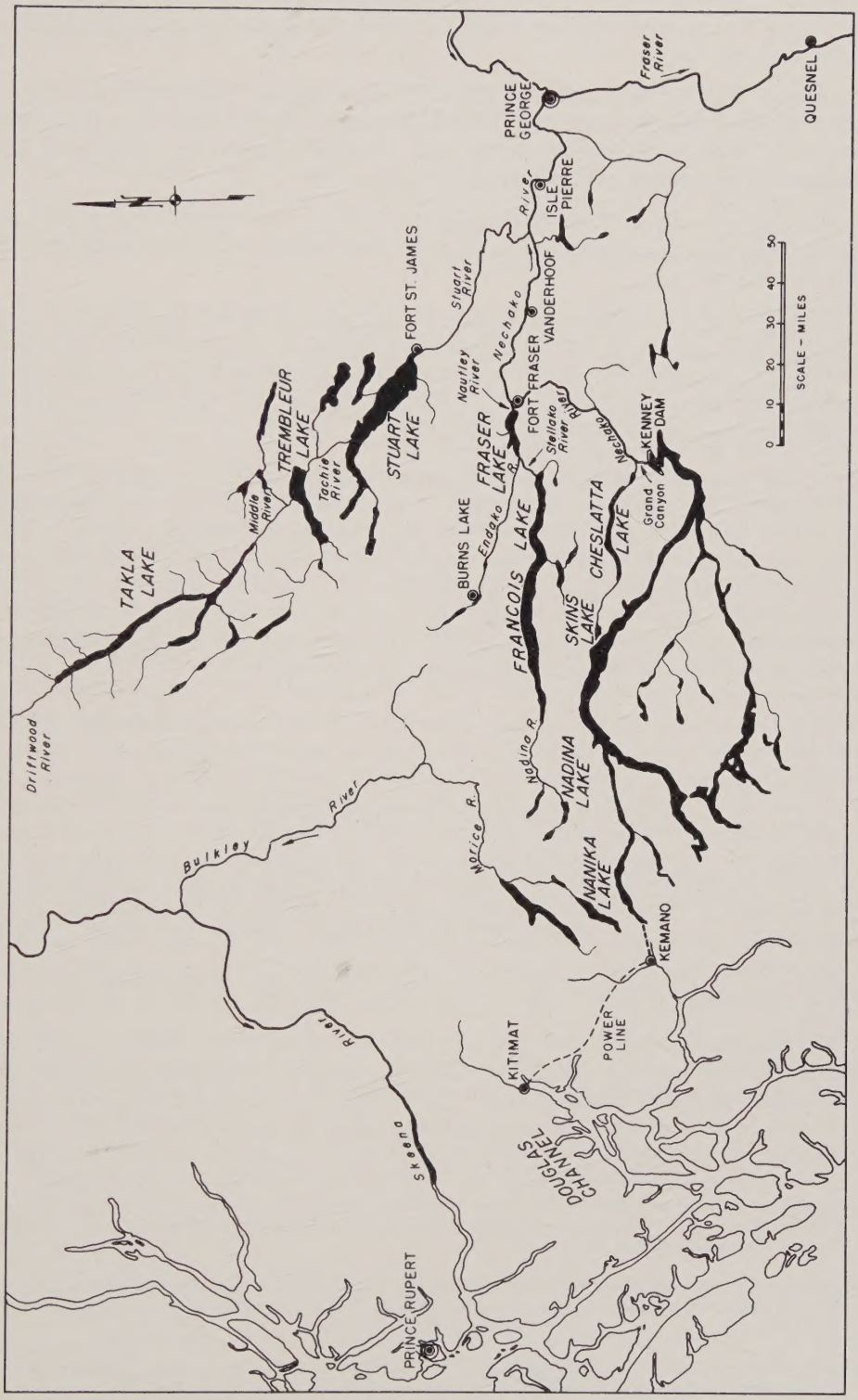

Figure 2. Nechako River system and the diversion to Kemano.

between Hope and the Vedder River junction, which could result in reduced survival of pink salmon eggs. The reduced discharge would also reduce the area of spawning ground available for use by pink salmon.

7. Reduced discharge in the lower Fraser River and its estuary could affect the environment in a critical stage of the life cycle of sockeye and pink salmon. Until the relationships between the environment and survival are fully understood, complete evaluation of the effects of a permanent reduction in discharge is not possible.

8. Diversion of water from the Skeena River system into the Nechako reservoir could introduce fish parasites and diseases into the Fraser River system which could be detrimental to Fraser River fish stocks.

There is ample evidence from experience and observation and in the literature to support the conclusion that losses to the production of sockeye could occur. The magnitude of the loss in a particular year would depend on climate and the remaining river discharge in relation to the timing and abundance of individual sockeye runs. With a combination of circumstances the losses could be substantial.

Possible solutions to the questions of adequate transportation flow and suitable water temperature in the Nechako River upstream from the Stuart River have been examined in detail in previous studies[1 2 3]. Sufficient flow depth for the migration of sockeye up the Nechako River could be obtained by discharge of water from the Nechako reservoir during the critical periods in July, August and September to maintain a flow of 1000 cfs. The volume required would vary from year to year, with an estimated maximum of 50,000 acre-feet, or about 0.93% of the total annual flow (5.35 million acre-feet) proposed to be diverted from the Nechako system for the existing and proposed development.

Water temperatures in the Nechako River above its confluence with the Stuart River could be controlled to the desired 68°F maximum by release of cooling water from the reservoir. The quantity of water required would vary depending on climate, and also on the temperature of the water released. It has been estimated that a maximum of 134,000 acre-feet of 45°F water would be needed, or about 2.5% of the total diversion. However, warming of this water as it flows downstream would result in supersaturation of dissolved gases in the Nechako River between the Nautley and Stuart Rivers at levels which could have adverse effects on sockeye. Therefore, the use of cooling water to control water temperature in the Nechako River could solve one aspect of the temperature problem but would introduce another problem. Furthermore, the cooling water would have adverse effect on the environment for other species in the Nechako River above the confluence with the Nautley River.

The changes in environment in the Fraser River downstream from Prince George due to reduced flow and increased temperature could not be prevented except by maintaining normal discharge during critical periods. The transfer of parasites and diseases from the Skeena system to the Nechako reservoir would be difficult to prevent and the most certain preventative measure would be to avoid the diversion. The quantities of water involved in

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[1] Department of Fisheries of Canada, International Pacific Salmon Fisheries Commission and Fisheries Research Board of Canada. 1951. Report on the fisheries problems created by the development of power in the Nechako-Kemano-Nanika River systems, 55p.

[2] Department of Fisheries of Canada and International Pacific Salmon Fisheries Commission. 1952. Report on the fisheries problems created by the development of power in the Nechako-Kemano-Nanika River systems, Supplement 1. 42p.

[3] International Pacific Salmon Fisheries Commission. 1979. Salmon Studies Associated with the Potential Kemano II Hydroelectric Development. Vol. 2. Sockeye Salmon Studies on the Nechako River. 99p.

avoiding these problems would amount to a very substantial part of the total additional diversion from the Nechako River.

At its 1979 Annual Meeting with the fishing industry, the Commission counselled against the additional diversion from the Nechako River, and suggested that instead of diverting further water from the Fraser River system to process aluminum, water now surplus to Alcan's existing requirements could be discharged in a manner most advantageous to flood control and to protection and development of the sockeye and other salmon resources of the Nechako and Fraser River systems. This course of action would minimize the effects of the existing diversion and would prevent further losses to the fisheries resource.

The sockeye salmon stocks that would be affected by the additional Nechako diversion provided a commercial catch of 2,380,000 sockeye annually in the period 1976-79, or 46.9% of the total commercial harvest of Fraser River sockeye. The Nechako system stocks provided 21.3% of the harvest with a landed value of $8.6 million annually at 1979 prices, and the other stocks (Bowron, Chilko, Horsefly, Gates) provided 25.6% with a landed value of $10.3 million annually. These stocks also provided catches averaging 200,000 fish annually to the Indian fishery or 80.1% of the catches in this fishery along the migration route up the Fraser system, with 43.1% coming from the Nechako stocks alone and 37.0% from the other stocks. This catch provides over 1,100,000 pounds of food annually to the Indian people. All these catches could be increased substantially as the potential of the lake rearing areas is developed. Full production from Takla, Trembleur, Stuart and Francois Lakes would add 4,600,000 sockeye annually to the catches, over four times more than present catches from the stocks reared in these lakes, and full production from Quesnel Lake could add from 800,000 to 2,000,000 catch annually. These potentials could be more difficult to attain and maintain with the additional diversion from the Nechako and even greater losses in production could occur with the larger stocks.

COMMISSION MEETINGS

The International Pacific Salmon Fisheries Commission held twenty-two formal and fifteen telephone meetings during 1979 with the approved minutes of the meetings being submitted to the Governments of Canada and the United States.

At the October 5, meeting the Commission received the resignation of Mr. Michael Guns representing Canadian Troll Fishermen. On November 30 the Commission approved the appointment of Mr. John Makowichuk as a member of the Advisory Committee representing Canadian Troll Fishermen. The Commission also approved the reappointment of Mr. Frank Nishii to his third term as Advisory Committee Member representing Canadian Gill Net Fishermen.

The membership of the Advisory Committee for 1979 was as follows:

Canada	*United States*
J. Brajcich Purse Seine Fishermen	W. Green Purse Seine Fishermen
J. O'Connor Salmon Processors	D. Franett Salmon Processors
F. Nishii Gill Net Fishermen	R. Christensen Gill Net Fishermen

N. Carr
Purse Seine Crew Members

T. Philpott
Reef Net Fishermen

M. Guns (To Oct. 5)
J. Makowichuk (From Nov. 30)
Troll Fishermen

G. Simmons
Troll Fishermen

H. English
Sports Fishermen

E. Engman
Sports Fishermen

The first meeting of 1979 was held February 20 with Mr. W. R. Hourston serving as Chairman and Mr. Gordon Sandison as Vice-Chairman and Secretary. The Commission met with its Advisory Committee regarding the tentative recommendations for regulatory control of the 1979 sockeye and pink salmon fishery in Convention Waters, as submitted to the Committee on December 8, 1978. After certain regulatory revisions, the Commission approved the recommended regulations for submission to the two national governments. On February 20 the Commission sent a letter to the Minister of Fisheries concerning the obtaining of catch records from the Fraser River area and from fish delivered to cold storage.

At its meeting on April 24 in Seattle, Washington the Commission approved a revised budget for 1979-80, the budget request for fiscal year 1980-81 and a draft of the 1978 Annual Report was also approved. The High Seas troll fishery regulations prior to July 29 were also discussed by the Commission.

On May 9 the Commission met with government personnel to review High Seas troll regulations being implemented by both governments. The Commission agreed to take no action until it was learned if the two national governments had accepted the Commission regulations as recommended.

The Commission met June 4 and was advised of correspondence received from the United States Government approving the Commission's regulations for the 1979 sockeye and pink salmon fishery in United States Convention Waters, with the exception that certain Treaty Indians are excluded and will be regulated under separate United States regulations, and the exception of recommended regulation of commercial trolling of the high seas.

The Commission was notified that the Canadian Government had also approved the regulation for the 1979 sockeye and pink salmon fishery in Canadian Convention Waters, with the exception of the regulation for commercial trolling on the high seas. The Commission amended its recommended regulation to the United States Government concerning commercial trolling on the high seas comprising the territorial waters of the United States and those waters contained in the United States Fishery Conservation Zone by recommending closure of the above mentioned waters to the taking of sockeye or pink salmon from June 15 to June 30, 1979.

During the period July 6 to October 5 inclusive the commission held fifteen formal and fourteen telephone meetings for adjustment of fishing regulations to achieve the desired escapement and, as nearly as practicable, equitable division of the allowable catch of Fraser River sockeye and pink salmon. On July 6 the Commission considered the Minister of Fisheries response to the Commission's telegram of June 22 protesting the Department of Fisheries and Oceans regulation for June 25 authorizing Chinook net fishing in the Fraser River area when closed under Commission regulations. On July 20 the Commission sent a letter of response to the Minister of Fisheries concerning the chinook salmon fishery in District No. 1 on June 25. On August 10, the Commission approved letters to both national governments to reaffim or clarify the Commission's responsibilities to the two High Con-

tracting Parties. On August 24th the Commission sent a letter to the Minister of Fisheries for Canada regarding the absence of good daily purse seine catch information. On October 10 the Commission inspected the Thompson River pink salmon spawning grounds, the two Commission pink salmon spawning channels at Lillooet and heard a staff report on the investigations of the adult sockeye migration delay at B.C. Hydro's Seton Creek hydroelectric plant. The Commission on November 20 approved the addition of 18,500 sockeye to Canadian Convention Waters catch as allowance for unreported sales to the public off docks along the Fraser River. The Commission met on November 30 to review the Annual Meeting presentation.

The twenty-second and final formal meeting of the year was held on December 7 in Vancouver, British Columbia, when the Commission held its Annual Meeting with its Advisory Committee and approximately 400 representatives of industry, government and press. A review of events during the sockeye and pink salmon season was presented by the Chairman. The catch and escapement statistics for 1979 were given by staff. The Director reported on the Aluminum Company of Canada plans for a second stage of development of the Nechako diversion to the Kemano power plant. Prospects for the 1980 fishing season were reviewed and tentative regulations for the 1980 fishery were proposed for consideration by industry and their representatives on the Commission Advisory Committee.

1979 REGULATIONS

Recommendations for regulations governing the 1979 sockeye and pink salmon fishery in Convention Waters were adopted at a meeting of the Commission held on February 20, 1979 and were submitted to the two national governments for approval on March 12, 1979. On May 30, 1979 the United States Government informed the Commission regarding its recommended 1979 regulations that they were approved with the following exceptions; that certain Treaty Indians are excluded and will be regulated under separate United States regulations, and the recommended regulations on commercial trolling on the high seas. The National Marine Fisheries Service was designated as the enforcing agency in co-operation with other federal agencies. On June 7, 1979 the Canadian Government notified the Commission of its approval of the proposed regulations for 1979 with the exception of that section pertaining to regulations of the High Seas troll fishery. The recommendations for Canadian Convention Waters were implemented during the fishing season under the Fisheries Act, Pacific Commercial Salmon Fishery Regulations.

The recommendations of the Commission were as follows:

Canadian Convention Waters

The International Pacific Salmon Fisheries Commission appointed pursuant to the Convention between Canada and the United States of America for the protection, preservation and extension of the Sockeye Salmon Fisheries of the Fraser River System, signed at Washington on the 26th day of May, 1930, as amended by the Pink Salmon Protocol signed at Ottawa on the 28th day of December, 1956, hereby recommends to the Canadian Government that, in the interests of such fisheries, the following Fraser River Sockeye and Pink Salmon Fishery Regulations for Convention Waters for the season of 1979 be adopted by Order-in-Council pursuant to Section 34 of the Fisheries Act, namely:

1. No person shall retain sockeye or pink salmon taken by commercial trolling gear in those waters westerly of a straight line between Bonilla Point in the Province of British Columbia and Tatoosh Island Lighthouse in the State of Washington from the 15th day of June, 1979 to the 28th day of July, 1979, both dates inclusive.

2. (1) No person shall fish for sockeye or pink salmon in the waters of the southerly portion of District No. 3 in that portion of Area 20 lying westerly of a line drawn true south from Sheringham Point Lighthouse to the International Boundary with nets from the 24th day of June, 1979 to the 4th day of August, 1979, both dates inclusive.

(2) No person shall fish for sockeye or pink salmon with purse seines in the waters described in subsection (1) of this section:

(a) From the 5th day of August, 1979 to the 11th day of August, 1979, both dates inclusive, except from half past six o'clock in the forenoon to half past six o'clock in the afternoon of Monday; and

(b) From the 12th day of August, 1979 to the 1st day of September, 1979, both dates inclusive, except from half past six o'clock in the forenoon to half past six o'clock in the afternoon of Monday and Tuesday of each week; and

(c) From the 2nd day of September, 1979 to the 15th day of September, 1979, both dates inclusive, except from seven o'clock in the forenoon to seven o'clock in the afternoon of Monday of each week.

(3) No person shall fish for sockeye or pink salmon with gill nets in the waters described in subsection (1) of this section:

(a) From the 5th day of August, 1979 to the 11th day of August, 1979, both dates inclusive, except from half past six o'clock in the afternoon of Monday to half past six o'clock in the forenoon of Tuesday; and

(b) From the 12th day of August, 1979 to the 1st day of September, 1979, both dates inclusive, except from half past six o'clock in the afternoon of Monday to half past six o'clock in the forenoon of Tuesday and from half past six o'clock in the afternoon of Tuesday to half past six o'clock in the forenoon of Wednesday of each week; and

(c) From the 2nd day of September, 1979 to the 15th day of September, 1979, both dates inclusive, except from seven o'clock in the afternoon of Monday to seven o'clock in the forenoon of Tuesday of each week.

(4) No person shall troll commercially for sockeye or pink salmon in the waters described in subsection (1) of this section from the 5th day of August, 1979 to the 15th day of September, 1979, both dates inclusive, except at times that net fishing may be permitted within that area.

3. No person shall fish for sockeye or pink salmon with nets in the waters of the southerly portion of District No. 3 embraced in Areas 17 and 18:

(1) From the 24th day of June, 1979 to the 7th day of July, 1979, both dates inclusive; and

(2) From the 8th day of July, 1979 to the 21st day of July, 1979, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Tuesday of each week; and

(3) From the 22nd day of July, 1979 to the 4th day of August, 1979, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Wednesday of each week; and

(4) From the 5th day of August, 1979 to the 11th day of August, 1979, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Tuesday; and

(5) From the 12th day of August, 1979 to the 29th day of September, 1979, both dates inclusive.

4. No person shall troll commercially for sockeye or pink salmon in that portion of waters described in section 3 lying easterly of a line from Thrasher Rock Light to Cordero Point on Valdez Island and along the easterly shoreline of Valdez Island to Vernaci Point, thence in a straight line to Race Point on Galiano Island and along the easterly shoreline of Galiano Island to Burrill Point, thence in a straight line to Georgina Point on Mayne Island, thence along the easterly shoreline of Mayne Island to Campbell Point, thence in a straight line to Winter Point on Saturna Island, thence along the easterly shore of Saturna Island to East Point, thence due south to the International Boundary, from the 12th day of August, 1979 to the 29th day of September, 1979, both dates inclusive.

5. No person shall fiish for sockeye or pink salmon with gill nets in District No. 1:

(1) From the 24th day of June, 1979 to the 7th day of July, 1979, both dates inclusive; and

(2) From the 8th day of July, 1979 to the 21st day of July, 1979, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Tuesday of each week; and

(3) From the 22nd day of July, 1979 to the 4th day of August, 1979, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Wednesday of each week; and

(4) From the 5th day of August, 1979 to the 8th day of September, 1979, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Tuesday of each week; and

(5) From the 9th day of September, 1979 to the 22nd day of September, 1979, both dates inclusive, except from seven o'clock in the afternoon of Monday to eight o'clock in the forenoon of Tuesday of each week, in those waters lying westerly of a line projected from Point Grey to the westerly end of the North Arm Jetty, thence to Sand Heads Light, thence southerly approximately 1.2 miles to the Roberts Bank Horn (#309), thence in a straight line to Georgina Point Light at Active Pass; and

(6) From the 23rd day of September, 1979 to the 6th day of October, 1979, both dates inclusive.

6. No person shall troll commercially for sockeye or pink salmon in those waters described in section 5 from the 12th day of August, 1979 to the 6th day of October, 1979, both dates inclusive, except at times that net fishing may be permitted within that area.

All times hereinbefore mentioned shall be Pacific Daylight Saving Time.

United States Convention Waters

The International Pacific Salmon Fisheries Commission appointed pursuant to the Convention between Canada and the United States of America for the protection, preservation and extension of the Sockeye Salmon Fisheries of the Fraser River System, signed at Washington on the 26th day of May, 1930, as amended by the Pink Salmon Protocol signed at Ottawa on the 28th day of December, 1956, hereby recommends to the United States Government that regulations to the following effect, in the interests of such fisheries in Convention Waters, be adopted for the year 1979, and that an approved copy of said regulations be forwarded to the Director of Fisheries of the State of Washington for implementation by virtue of authority in him vested by Section 6 of Chapter 112 of the Laws of the State of Washington of 1949, namely:

1. No person shall retain sockeye or pink salmon taken by commercial trolling gear in the waters westerly of a straight line drawn from the Tatoosh Island Lighthouse in the State of Washington to Bonilla Point in the Province of British Columbia from the 15th day of June, 1979 to the 28th day of July, 1979, both dates inclusive.

2. No person shall fish for sockeye or pink salmon with nets from the 24th day of June, 1979 to the 14th day of July, 1979, both dates inclusive.

3. (1) No person shall fish for sockeye or pink salmon with purse seines in Puget Sound Salmon Management and Catch Reporting Areas 4B, 5 and 6C:

(a) From the 15th day of July, 1979 to the 4th day of August, 1979, both dates inclusive, except from five o'clock in the forenoon to half past nine o'clock in the afternoon of Monday and Tuesday of each week; and

(b) From the 5th day of August, 1979 to the 18th day of August, 1979, both dates inclusive, except from five o'clock in the forenoon to half past nine o'clock in the afternoon of Monday of each week; and

(c) From the 19th day of August, 1979 to the 8th day of September, 1979, both dates inclusive, exept from five o'clock in the forenoon to nine o'clock in the afternoon of Monday and Tuesday of each week; and

(d) From the 9th day of September, 1979 to the 15th day of September, 1979, both dates inclusive, except from five o'clock in the forenoon to nine o'clock in the afternoon of Monday.

(2) No person shall fish for sockeye or pink salmon with gill nets in the waters described in subsection (1) of this section:

(a) From the 15th day of July, 1979 to the 21st day of July, 1979, and from the 29th day of July, 1979 to the 4th day of August, 1979, all dates inclusive, except from seven o'clock in the afternoon of Sunday to half past nine o'clock in the forenoon of Monday and from seven o'clock in the afternoon of Monday to half past nine o'clock in the forenoon of Tuesday of each week; and

(b) From the 22nd day of July, 1979 to the 28th day of July, 1979, both dates inclusive, except from seven o'clock in the afternoon of Monday to half past nine o'clock in the forenoon of Tuesday and from seven o'clock in the afternoon of Tuesday to half past nine o'clock in the forenoon of Wednesday; and

(c) From the 5th day of August, 1979 to the 11th day of August, 1979, both dates inclusive, except from seven o'clock in the afternoon of Monday to half past nine o'clock in the forenoon of Tuesday; and

(d) From the 12th day of August, 1979 to the 18th day of August, 1979, both dates inclusive, except from seven o'clock in the afternoon of Sunday to half past nine o'clock in the forenoon of Monday; and

(e) From the 19th day of August, 1979 to the 25th day of August, 1979, and from the 2nd day of September, 1979 to the 8th day of September, 1979, all dates inclusive, except from six o'clock in the afternoon of Monday to nine o'clock in the forenoon of Tuesday and from six o'clock in the afternoon of Tuesday to nine o'clock in the forenoon of Wednesday of each week; and

(f) From the 26th day of August, 1979 to the 1st day of September, 1979, both dates inclusive, except from six o'clock in the afternoon of Sunday to nine o'clock in the forenoon of Monday and from six o'clock in the afternoon of Monday to nine o'clock in the forenoon of Tuesday; and

(g) From the 9th day of September, 1979 to the 15th day of September, 1979, both dates inclusive, except from six o'clock in the afternoon of Sunday to nine o'clock in the forenoon of Monday.

(3) No person shall fish for sockeye or pink salmon with commercial trolling gear in the waters described in subsection (1) of this section from the 15th day of July, 1979 to the 15th day of September, 1979, both dates inclusive, except from Monday through Friday of each week on those days when purse seine fishing is permitted within that area.

4. (1) No person shall fish for sockeye or pink salmon with purse seines in Puget Sound Salmon Management and Catch Reporting Areas 6, 6A, 7, 7A and 7B:

(a) From the 15th day of July, 1979 to the 4th day of August, 1979, both dates inclusive, except from five o'clock in the forenoon to half past nine o'clock in the afternoon of Monday and Tuesday of each week; and

(b) From the 5th day of August, 1979 to the 18th day of August, 1979, both dates inclusive, except from five o'clock in the forenoon to half past nine o'clock in the afternoon of Monday of each week; and

(c) From the 19h day of August, 1979 to the 8th day of September, 1979, both dates inclusive, except from five o'clock in the forenoon to nine o'clock in the afternoon of Monday and Tuesday of each week; and

(d) From the 9th day of September, 1979 to the 22th day of September, 1979, both dates inclusive, except from five o'clock in the forenoon to nine o'clock in the afternoon of Monday of each week.

(2) No person shall fish for sockeye or pink salmon with reef nets in the waters described in subsection (1) of this section:

(a) From the 15th day of July, 1979 to the 21st day of July, 1979, and from the 29th day of July, 1979 to the 4th day of August, 1979, all dates inclusive, except from half past six o'clock in the forenoon to half past nine o'clock in the afternoon of Sunday and from five o'clock in the forenoon to half past nine o'clock in the afternoon of Monday of each week; and

(b) From the 22nd day of July, 1979 to the 28th day of July, 1979, both dates inclusive, except from seven o'clock in the forenoon to half past seven o'clock in the afternoon of Sunday and from five o'clock in the forenoon to half past seven o'clock in the afternoon of Monday; and

(c) From the 5th day of August, 1979 to the 11th day of August, 1979, both dates inclusive, except from seven o'clock in the forenoon to half past seven o'clock in the afternoon of Sunday; and

(d) From the 12th day of August, 1979 to the 18th day of August, 1979, both dates inclusive, except from half past six o'clock in the forenoon to half past nine o'clock in the afternoon of Sunday; and

(e) From the 19th day of August, 1979 to the 25th day of August, 1979, and from the 2nd day of September, 1979 to the 8th day of September, 1979, all dates inclusive, except from seven o'clock in the forenoon to half past seven o'clock in the afternoon of sunday and from five o'clock in the forenoon to half past seven o'clock in the afternoon of Monday of each week; and

(f) From the 26th day of August, 1979 to the first day of September, 1979, both dates inclusive, except from half past six o'clock in the forenoon to nine o'clock in the afternoon of Sunday and from five o'clock in the forenoon to nine o'clock in the afternoon of Monday; and

(g) From the 9th day of September, 1979 to the 15th day of September, 1979, both dates inclusive, except from half past six o'clock in the forenoon to nine o'clock in the afternoon of Sunday; and

(h) From the 16th day of September, 1979, to the 22nd day of September, 1979, both dates inclusive, except from seven o'clock in the forenoon to half past seven o'clock in the afternoon of Sunday.

(3) No person shall fish for sockeye or pink salmon with gill nets in the waters described in subsection (1) of this section:

(a) From the 15th day of July, 1979 to the 21st day of July, 1979, and from the 29th day of July, 1979 to the 4th day of August, 1979, all dates inclusive, except from seven o'clock in the afternoon of Sunday to half past nine o'clock in the forenoon of Monday and from seven o'clock in the afternoon of Monday to half past nine o'clock in the forenoon of Tuesday of each week; and

(b) From the 22nd day of July, 1979 to the 28th day of July, 1979, both dates inclusive, except from seven o'clock in the afternoon of Monday to half past nine o'clock in the forenoon of Tuesday and from seven o'clock in the afternoon of Tuesday to half past nine o'clock in the forenoon of Wednesday; and

(c) From the 5th day of August, 1979 to the 11th day of August, 1979, both dates inclusive, except from seven o'clock in the afternoon of Monday to half past nine o'clock in the forenoon of Tuesday; and

(d) From the 12th day of August, 1979 to the 18th day of August, 1979, both dates inclusive, except from seven o'clock in the afternoon of Sunday to half past nine o'clock in the forenoon of Monday; and

(e) From the 19th day of August, 1979 to the 25th day of August, 1979, and from the 2nd day of September, 1979 to the 8th day of September, 1979, all dates inclusive, except from six o'clock in the afternoon of Monday to nine o'clock in the forenoon of Tuesday and from six o'clock in the afternoon of Tuesday to nine o'clock in the forenoon of Wednesday of each week; and

(f) From the 26th day of August, 1979 to the 1st day of September, 1979, both dates inclusive, except from six o'clock in the afternoon of Sunday to nine o'clock in the forenoon of Monday and from six o'clock in the afternoon of Monday to nine o'clock in the forenoon of Tuesday; and

(g) From the 9th day of September, 1979 to the 15th day of September, 1979, both dates inclusive, except from six o'clock in the afternoon of Sunday to nine o'clock in the forenoon of Monday; and

(h) From the 16th day of September, 1979 to the 22nd day of September, 1979, both dates inclusive, except from six o'clock in the afternoon of Monday to nine o'clock in the forenoon of Tuesday.

5. (1) No person shall fish for sockeye or pink salmon with nets in that portion of the waters described in subsection (1) of section 4 lying northerly and westerly of a straight line drawn from Iwersen's Dock on Point Roberts in the State of Washington to Georgina Point Light at the entrance to Active Pass in the Province of British Columbia from the 26th day of August, 1979 to the 1st day of September, 1979, and from the 23rd day of September, 1979 to the 6th day of October, 1979, all dates inclusive.

(2) No person shall fish for sockeye or pink salmon with nets in that portion of the waters described in subsection (1) of section 4 lying westerly of a straight line drawn from the low water range marker in Boundary Bay on the International Boundary through the east tip of Point Roberts in the State of Washington to the East Point Light on Saturna Island in the Province of British Columbia from the 2nd day of September, 1979 to the 22nd day of September, 1979, both dates inclusive.

6. The foregoing recommended regulations shall not apply to the following waters:

(1) Puget Sound Salmon Management and Catch Reporting Areas as follows;

(a) The waters of Area 7B lying easterly and inside of a line projected from Gooseberry Point on the mainland due south to its intersection with Lummi Island (the Initiative 77 line), thence along the eastern shoreline of Lummi Island to Carter Point, thence to the most northerly tip of Vendovi Island, thence to Clark Point on Guemes Island following the shoreline to Southeast Point on Guemes Island, thence to March Point on Fidalgo Island; and

(b) Areas 6B and 7c.

(2) Preserves previously established by the Director of Fisheries of the State of Washington for the protection of other species of food fish.

All times hereinbefore mentioned shall be Pacific Daylight Saving Time.

Emergency Orders

In order to provide for adequate racial escapement of Fraser River sockeye and pink salmon and for an equitable share of the season's catch by fishermen of the United States and Canada, the approved regulations as detailed above with exceptions were later adjusted by the Commission as follows:

June 4, 1979 – In the interest of consistency with regulations promulgated by the United States concerning commercial trolling, the Commission approved the following regulation: no person shall fish for sockeye or pink salmon by commercial trolling gear in that portion of Convention Waters westerly of a straight line drawn from Tatoosh Island Lighthouse in the State of Washington to Bonilla Point in the Province of British Columbia comprising the Territorial waters of the United States and those high seas waters contained in the United States Fishery Conservation Zone from the 15th day of June, 1979 to the 30th day of June, 1979, both dates inclusive.

July 13, 1979 – In order to secure escapement of early summer sockeye runs, the Commission approved a one day reduction of fishing time in United States Convention Waters to one day for the week commencing July 15.

July 20, 1979 – In the interest of securing additional escapement of early summer sockeye races, the Commission approved the following changes in regulations for the week commencing July 22: 1. That District No. 1 and Areas 17 and 18 of Canadian Convention Waters open as scheduled for only 24 hours fishing. 2. That United States Convention Waters open as scheduled but for only one day of fishing.

July 27, 1979 – In the interest of division of catch and additional sockeye escapement the Commission approved that United States Convention Waters and District No. 1 and Areas 17 and 18 of Canadian Convention Waters open as scheduled in the week commencing July 29, but for one day of fishing only.

August 6, 1979 – In the interest of harvesting summer-run sockeye the Commission approved a one day extension in United States Convention Waters and District No. 1 and Areas 17 and 18 of Canadian Convention Waters, making a total of two days fishing in each area for the current week.

August 10, 1979, A.M. – In the interest of division of catch the Commission announced that United States Convention Waters would not open as scheduled for the week commencing August 12.

August 10, 1979, P.M. – In the interest of harvesting summer-run sockeye the Commission approved the following changes in regulations for the week commencing August 12: 1. That the opening in District No. 1 of Canadian Convention Waters be advanced 24 hours. 2. That United States Convention Waters open August 14 for one day of fishing.

August 14, 1979 – In the interest of division of catch the Commission approved an additional one day of fishing in United States Convention Waters, making two days fishing for the current week.

August 15, 1979 – In order to obtain additional harvest of summer-run sockeye the Commission announced that District No. 1 of Canadian Convention Waters would open at 8:00 a.m. August 16 for 24 hours.

August 21, 1979 – In the interest of harvesting summer-run sockeye and the additional harvest of pink salmon the Commission approved the following changes in regulations: 1. That District No. 1 of Canadian Convention Waters open at 8:00 a.m. August 23 for 12 hours fishing easterly of the Blue Line. 2. That United States Convention Waters re-open August 23 for one day of fishing making a total of three days fishing for the week. 3. That fishing time in Area 20 of Canadian Convention Waters be extended 24 hours making a total of three days for the week.

August 23, 1979 – In the interest of division of catch and harvest of pink salmon the Commission approved opening Area 20 of Canadian Convention waters on August 25 for three days of fishing.

August 24, 1979 – In the interest of additional harvest of pink salmon the Commission approved advancing the opening time in United States Convention Waters for the week commencing August 26 by 24 hours for two days of fishing.

August 27, 1979 – In the interest of division of catch the Commission approved re-opening United States Convention Waters on August 29 for one day of fishing, making a total of three days fishing for the week.

August 28, 1979 – In the interest of harvesting pink salmon the Commission approved opening Area 20 of Canadian Convention Waters August 30 for two days fishing.

August 30, 1979 – In the interest of division of catch and escapement of pink salmon the Commission approved reducing fishing times in Area 20 of Canadian Convention Waters to one day of fishing in the current period.

August 31, 1979 – In the interest of division of catch and escapement of late run pink salmon the Commission approved the following changes in regulations for the week commencing September 2: 1. That United States Convention Waters open as scheduled by for one day of fishing. 2. That Area 20 of Canadian Convention Waters not open as scheduled. 3. That District No. 1 of Canadian Convention Waters not open as scheduled but open from 7:00 p.m. September 4 to 8:00 a.m. September 5 westerly of the Georgina Point Light line.

September 7, 1979 – In view of concern for escapement of pink salmon the Commission approved the following changes in regulations: 1. That regulatory control in Convention Waters westerly of Bonilla-Tatoosh line be relinquished effective 12:01 a.m. September 9. 2. That all remaining Convention Waters not open as scheduled for the week commencing September 9.

September 11, 1979 – In view of low abundance of sockeye and pink salmon the Commission approved relinquishing regulatory control of Convention Waters westerly of Angeles Point-William Head Line effective 12:01 a.m. September 12.

September 14, 1979 – In the interest of protecting the early pink salmon and sockeye salmon delaying in the Strait of Georgia the Commission announced that District No. 1 of Canadian Convention Waters would not open as scheduled for the week commencing September 16.

September 21, 1979 – Due to the declining numbers of pink salmon the Commission relinquished regulatory control of United States Convention Waters lying easterly and southerly of the East Point Roberts-East Point Line effective 12:01 September 23.

September 25, 1979 – In the interest of harvesting late run sockeye and due to the declining abundance of pink salmon in United States Waters, the Commission approved the following regulation changes. 1. That United States Convention Waters southerly of Iwersen's Dock Line be relinquished effective at 12:01 a.m. September 30. 2. That District No. 1 of Canadian Convention Waters open from 7:00 p.m. October 1 to 8:00 a.m. October 2 westerly of the Georgina Point Light Line.

The Commission relinquished regulatory control of the remaining Convention Waters effective October 7 as scheduled, thus completing the Commission's regulatory obligations for Convention Waters for the 1979 season.

SOCKEYE SALMON REPORT

The Fishery

The total 1979 Fraser River sockeye run was estimated at 6,426,000 compared with the preseason forecast of 3,800,000. It was probably the third largest run on the cycle since 1899 and exceeded the brood year run by about 2,759,000 fish. The number of Fraser sockeye entering Convention Waters was 5,081,000 of which 3,382,833 (66.6%) were caught commercially, 290,344 (5.7%) were taken by the Indians in the Fraser River watershed, and 1,407,828 (27.7%) were recorded on the spawning grounds (see Tables I to VI in Appendix). An estimated total of 13,308 non-Fraser sockeye, mainly from the run to Lake Washington in Washington State, were also caught in Convention Waters. The estimated catches of Fraser River sockeye in non-Convention Waters in Johnstone Strait and northern Strait of Georgia, and coastal waters north of Convention Waters, were 1,010,000 and 335,000 respectively. The non-Convention Waters catch of Fraser River sockeye migrating through Johnstone Strait was 21.4% of the total commercial catch of Fraser sockeye in all areas, and 15.7% of the total run.

The total 1979 Convention Waters catch of sockeye was above the average cycle catch of 2,810,000 made from 1947-1975 even though an above average percentage of the run migrated through Johnstone Strait and was available to non-Convention Water fisheries. In the Convention area, Canadian fishermen caught 1,620,265 sockeye (47.7%) and United States fishermen caught 1,775,876 sockeye (52.3%) (Appendix Tables I and II).

In 1978, the proportion of the run approaching the Fraser River through Johnstone Strait reached an estimated record high of 58%. The diversion in 1979, estimated at 30%, was the largest on record for the cycle. The average diversion rate for cycle years 1955-1975 was 13%. In both 1978 and 1979, a high percentage of the total Fraser River sockeye run was consequently caught in fisheries outside of Convention Waters, with a record 42.8% in 1978 followed by an estimated 20.9% in 1979.

Management of the sockeye runs by the Commission under these conditions becomes more complex. Another complicating factor is the action of the United States Government in

promulgating separate regulations for certain Treaty Indian Tribes. Approximately 310,000 sockeye were taken by these fishermen at times when the waters were closed by Commission regulations. Under Commission regulations in 1979 in Washington State Areas 6, 6A, 7 and 7A, a total of 15 separate fishing periods were authorized. Treaty Indians were granted fishing privileges for an additional 21 gill net and 13½ purse seine separate fishing periods in these same areas. In Areas 4B, 5 and 6C, Commission regulations specified a total of 14 separate fishing periods, whereas the United States Government granted 24 additional fishing periods. One of the original purposes of the Convention was to have a single regulatory authority in control of the Fraser River sockeye fishery. In 1979, only 61% of the catch was made under Commission regulations. Continued erosion of Commission control could have serious consequences to management of the resource in future years.

In Canadian Convention Waters, 519,681 (32.1%) sockeye were taken in the waters westerly of William Head, while 1,100,584 (67.9%) sockeye were caught easterly of William Head, mainly in the Fraser River. From 1959-1975 the average percentage of total Canadian catch made in the Western area has been 37.7%. In addition, trollers took 36.7% of the total catch made in the Western area in 1979. A combination of lower rate of production for the later running races such as Adams River and Weaver Creek sockeye compared with high rates of return for Chilko and Stellako sockeye and the high diversion through Johnstone Strait resulted in only 20.3% catch in Area 20 (Table 1). The total catch in District I of 1,091,924 sockeye was the largest on the cycle since 1971.

Table 1. Canadian Convention Waters Catch – % of total catch

	Area 20	District I
1963*	146,286 (21.3%)	514,245 (74.9%)
1967	855,491 (45.6%)	868,159 (46.3%)
1971	1,548,953 (49.7%)	1,292,183 (41.5%)
1975*	87,341 (13.6%)	503,447 (78.1%)
1979	328,768 (20.3%)	1,091,924 (67.4%)

* Lengthy strike

Changes in the proportion of purse seines and gill nets fishing in Area 20 have occurred in recent years thus affecting the total catch made by the two gears. In 1967 there were 102 purse seines and 341 gill nets fishing the area and gill nets took 30.2% of the total net catch. In 1979, 133 purse seines and only 115 gill nets fished the area and the gill net percentage declined to only 12.7%. The total troll catch in Canadian Convention Waters of 217,118, forming 13.4% of the total catch, was the largest number and percentage on record for the cycle. In cycle year 1971, the troll catch of 191,160 constituted only 15.5% of the purse seine catch whereas in 1979 the troll catch of 217,118 was 74.4% of the purse seine catch. These data illustrate the changes in the proportion of catch that occurs due to changes in the amount of gear fishing, differences in racial availability to the gear, unrestricted high seas trolling, weekly starting times between purse seines and gill nets and other factors such as increased diversion of sockeye through Johnstone Strait.

In United States Convention Waters, the purse seine catch of 942,566 was a slight improvement compared with 1975 (896,416) but far below the catches made by this gear in cycle year 1967 and 1971 (1,387,370 and 1,607,117, respectively) (Table I in Appendix). The

percent taken by seines (53.1%) was the lowest ever on the cycle. The gill net catch of 779,807 (43.9%) was an increase in both number and percent compared with 1975 (615,790, 39.4%). The percentage taken was the highest ever for the cycle year. Reef nets caught 52,201 sockeye, only a slight increase compared to 1975 (51,096), and the percentage taken in 1979 (2.9%) was the lowest ever for the cycle year declining further from the low of 3.3% recorded in 1975. The decline in the percentage taken by reef nets over several years is similar to that observed for purse seine gear.

Fishing effort (total units fishing) during the sockeye season continued to decrease in Canadian convention Waters except for increase in purse seines and in the United States the total number of units of fishing gear continued to increase (primarily gill nets) (Table 2).

Table 2. Fishing Units operating in Convention Waters

	1971	1975*	1979
Canadian Convention Waters			
Purse Seines (Area 20)	117	109	131
Gill Nets	1,357	964	835
	1,474	1,073	966
United States Convention Waters			
Purse Seines	166	232	184
Gill Nets	650	902	1,133
Reef Nets	45	52	56
	861	1,186	1,373

* Strike – Canada

A significant feature of the 1979 season in United States Convention Waters took place on August 6 when a record sockeye catch of 563,830 took place (Figure 3). The magnitude of this harvest had not been indicated by Troll and Area 20 commercial catches or from test fishing data. Since there was no means by which the second day of fishing in the United States (August 7) could have been eliminated the difference in division of catch through August 7 was about 400,000 in favor of the United States. The record single day's catch created a division problem that persisted to the end of the season. Since Canada at this time was ahead of the United States on pink salmon catch by about 600,000 fish, it was not practical to reduce fishing in United States drastically in subsequent weeks at a time when the pink salmon run was increasing. A seasons difference of 156,000 sockeye in favor of the United States was obtained in spite of the problems created by the largest single day catch and large catch made by Treaty Indians (310,000) outside the Commission's control. The catch made by the Indian fishery on August 5 was in itself 150,000, about the equivalent of a third day of fishing for the week.

Examination of the catch and racial data associated with the large catch of 564,000 sockeye made on August 6 in United States Convention reveals that many of the fish taken were delaying fish. Many of the fish examined were watermarked and some pinkish in color. A higher proportion of Stellako River sockeye appeared in the Point Roberts and below Pattulo Bridge samples compared with the Salmon Banks and above bridge samples indicating that Stellako sockeye were delaying in the lower Fraser-Georgia Strait-Point Roberts area. The larger catch per purse seine at Point Roberts on August 6 of 2,202 compared with

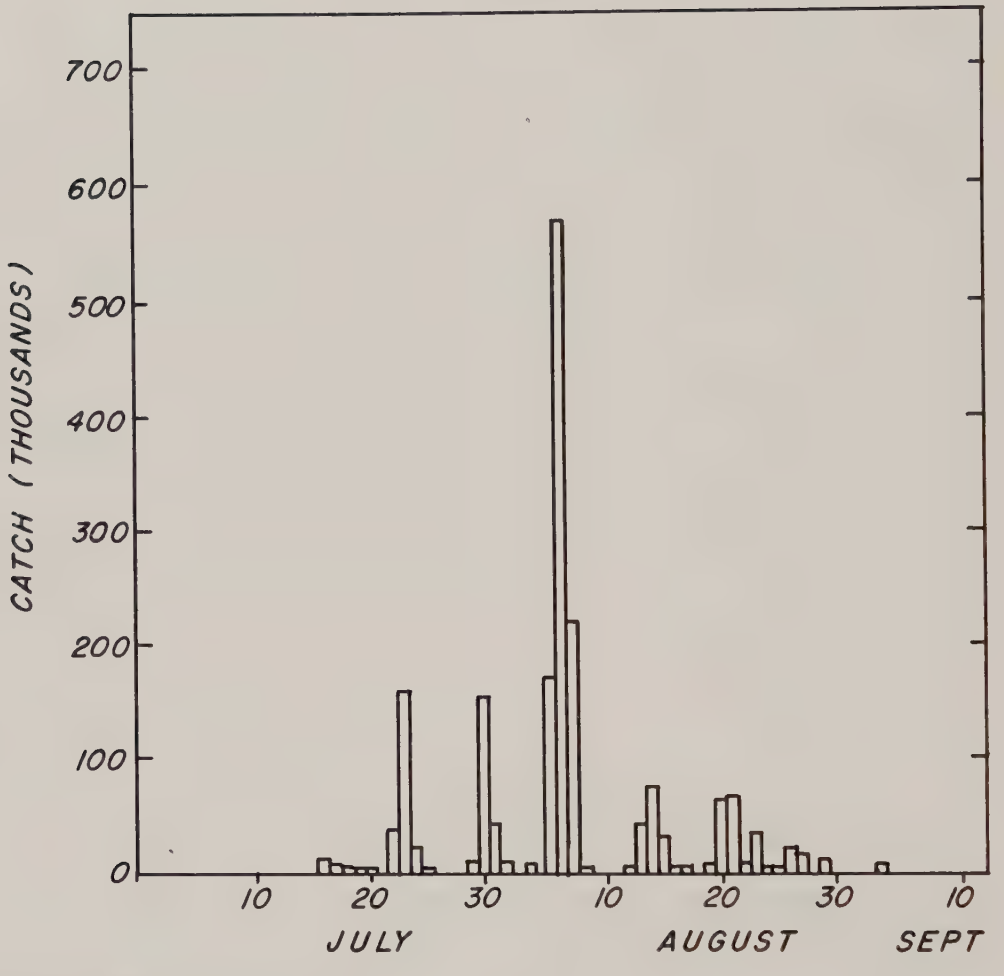

Figure 3. United States sockeye catches, 1979

1,742 at Salmon Banks gives further indication of the delay. In addition, the catch in the Fraser River below Patullo Bridge was substantially larger on August 6 than would have been expected in relation to the catch above the bridge suggesting delaying fish in the lower area. This delay was also noticed from the second day's catch below the bridge (177,000) which held up exceptionally well compared with the first day's catch (287,000). Usually, the second day's catch (mainly in the Georgia Strait) will be only one-quarter to one-third the first day's catch. In all, about 1,415,000 sockeye were caught in United States Waters (950,000) and in District I (465,000) during the period August 5-7. The August 6 catch represented the peak daily catch for the three major races; Chilko, Stellako and Adams. This was the first time on record that these three races had peak catches on the same day in the same area.

Several races had excellent survival in 1979 and production exceeded the pre-season forecast by a considerable amount for Chilko and Stellako River sockeye. The Stellako River race totalled an estimated 1,700,000 fish, the largest return on record. The total Chilko return was estimated to be 1,600,000. The Adams River run also exceeded the prediction and is

estimated to have been about 1,000,000. The late Nadina River race produced as estimated 300,000 fish and this also was the largest return on record. A large proportion of this return (87.4%) is attributable to the spawning channel. The Late Stuart sockeye run was the largest ever on the cycle and the Fennell Creek run was possibly the largest ever. Exceptional production was also observed for the Cultus and Harrison River stocks.

The average weight of 4-year old sockeye during the period from July 16 to August 23, 1979 was 5.56 pounds, below the long term cycle average (1915-1975) of 5.96 pounds.

Escapement

The net escapement of 1,407,828 sockeye represented 27.7% of the 1979 Fraser run to Convention Waters and 21.9% of the calculated total Fraser River run. The total escapement was the largest on the cycle since 1963 with excellent balance between the many races and improvement in numbers to several spawning areas.

The total escapement reaching the Early Stuart streams was 92,763 (Table VI in Appendix) compared with 65,767 in 1975. The 1979 escapement almost reached the record cycle level observed in 1971 of 95,942 spawners and that run produced the largest return on record for the cycle in 1975. The good escapement observed in 1979 is tempered somewhat by a 24% prespawning loss at the spawning grounds. The estimated gross escapement of Early Stuart sockeye past Mission based on echo sounding was 191,400 and the estimated Indian catch of this race in all areas of the Fraser River and its tributaries was 68,000. Total run size in 1979 is estimated at about 250,000 compared with the large return in the brood year of 426,100.

The Late Stuart escapement has shown remarkable improvement on this cycle increasing from only about 1,500 spawners in 1971 to 14,000 in 1975 and a cycle record of 31,918 in 1979.

The Bowron River run continued to be dominant on the 1979 cycle and the escapement of 35,000 was the largest on record.

The numbers of sockeye escaping into the Nechako District in 1979 was very encouraging. The Early Nadina River escapement of 1,809 was the largest on record for the cycle and compares with only 481 in the brood year. Success of spawning was excellent (97.6%). The escapement of 55,686 sockeye for the Late Nadina River run was the largest ever, with 14,474 in the river and 41,212 in the spawning channel. The total numbers permitted into the channel exceeded design capacity, however this was done in order to obtain the maximum number of eggs for deposition in the channel because of 45% pre-spawning mortality that occurred. This mortality was the largest recorded for this race and further discussion of the problem is presented in the Research section of this report. Despite this unusual loss of spawners, the number of effective females was more than double the brood year and the channel was filled to about 87% capacity with effective spawners. Spawners using the river suffered only 19% pre-spawning loss. The record production of Stellako River sockeye also resulted in a record escapement of 290,116. This is considered a maximum number of fish for the area available. Success of spawning was good (93%). It would appear that this race is now dominant on the 1979 cycle whereas in former years it was dominant on the 1978 cycle. The evidence to date suggests that the subdominant run is now forming on the 1980 cycle.

The Chilko River run was a major producer in 1979 on the subdominant return year for this stock. The escapement into Chilko River of 240,294 fish was the largest number of

effective spawners on the cycle since 1959. The South End Chilko Lake population declined from 55,144 in 1975 to 32,400 in 1979. The total escapement of 272,694 into the Chilko area in 1979 was almost the same as four years ago (275,698).

Escapement into Seymour River was 49,321, the largest on the cycle since 1963 and this level of escapement is considered close to the optimum number of spawners. Observations in 1979 for returning fish into Upper Adams River from the eyed egg transplant of Seymour River stock in 1975 showed no fish returned.

The Raft River run in the North Thompson District declined to 1,708 spawners in 1979. However, the Fennell Creek run increased dramatically from only 1,300 spawners in 1971 to the 15,590 in 1979, the largest on record.

Gates Creek total escapement increased only slightly to 5,025 in 1979 from 4,556 in 1975 but the adult portion of the escapement in 1979 (3,828) was almost doubled from 1975 (1,982). The escapement into the spawning channel was 4,118 with only 64.2% success of spawning. The 907 spawners in the creek had only 48.5% success of spawning. The Portage Creek escapement of 3,663 was just slightly below the number four years ago (3,829).

Escapement into Pitt River (37,558) was similar to 1975 (39,942) and about 65% of the 1979 escapement was five-year-old fish.

The Birkenhead River escapement was 78,088 compared with 92,928 in the brood year. Although the total escapement was less in 1979 the number of adult spawners in 1979 (60,988) was similar to 1975 (61,538). A high proportion (80%) of the adult escapement in 1979 was five-year-olds. The success of spawning in 1979 was 90.3% compared with only 53.7% in 1975.

The Adams-Little River escapement of 286,059 was considered satisfactory for the subdominant cycle and represented a significant increase over the brood year escapement of 155,455. The number of sockeye (10,092) observed on the Lower Shuswap River was disappointing and was less than in the brood year (11,652).

Escapements in other late run spawning areas such as Weaver Creek, Cultus Lake and Harrison River were larger than in the brood year. At Weaver Creek a total of 51,403 returned with 22,888 spawning in the channel. This escapement was about 20,000 more than the return in 1975 (32,011). The escapement to Cultus Lake (32,045) was almost three times larger than in 1975 (11,478) and maintains the history of good production on this cycle. An outstanding escapement (45,706) was observed in the Harrison River compared with only 5,987 in 1975. This was the largest sockeye escapement on record in this river.

The recorded Indian Fishery catch in the Fraser River and its tributaries was 290,344, the largest on record.

Estimates of daily escapement of sockeye migrating past Mission, the upstream boundary of commercial fishing, are obtained each year. Echo sounding techniques developed over several years gave an estimate of 1,302,000 fish for summer run sockeye in 1979 while the spawning ground escapements and the recorded Indian Fishery catch totalled 1,200,000 fish, and 8.5% difference. On the other hand, later in the season, attempts to estimate the pink salmon and Adams River sockeye migrating at the same time produced a total which was only about one-half the accounted escapement and Indian catch.

The echo sounder is mounted on a boat which transverses the river nearly continuously for 16 or 24 hours each day. This method samples about 0.5% of total migration. During 1979, tests were conducted with an automatic recording and counting system using an array of transducers placed across the river bottom. Investigation of this and other possible methods of simplifying the work and improving the accuracy continues.

PINK SALMON REPORT

The Fishery

The total 1979 Fraser River pink salmon run was estimated at 14,100,000, almost equal to the predicted 15,000,000 return. The run was probably the largest pink salmon run produced by the Fraser since 1947 but still considerably below the potential production available from the system.

Total numbers of fry produced by the 1977 escapement was 473,300,000 (Table 3), the largest since enumeration started in 1962 and 180,900,000 more than the previous largest migration from the 1973 spawners. The advantages of large fry migration associated with average or above average sea survival rate is evidenced by the 1979 return. Sea survival of the fry has varied from 0.8% to 5.0% with an average of 2.9% through the 1977 return. Survival of fry produced by the 1977 escapement was 3.0% or just slightly above the average. With a 5% sea survival the 1979 return had the potential of reaching a run of about 24 million.

The total number of pink salmon entering Convention Waters in 1979 was estimated to be 12,951,000 fish (Table 4) compared to 7,565,000 in the brood year. Fraser River pink salmon formed 82.1% of the total in 1979. The harvest of 829,000 United States pink salmon stocks in Convention Waters constituted 42.2% of the United States run to Convention Waters, whereas 66.0% of the Fraser run to Convention Waters was harvested.

Table 3. Fraser River pink salmon production. (Fry production data not available prior to 1961.)

	Brood Year								
	1961	1963	1965	1967	1969	1971	1973	1975	1977
Total Spawners (millions)	1.094	1.953	1.191	1.831	1.529	1.804	1.754	1.367	2.388
Female Spawners (millions)	.654	1.217	.692	1.015	.961	1.103	1.015	.806	1.421
Potential Egg Deposition (billions)	1.5692	2.4348	1.4878	2.1321	2.0182	1.923	1.865	1.493	2.960
Fry Production (millions)	143.6	284.2	274.0	237.6	195.6	245.0	292.4	279.2	473.3
Adult Return Catch + Escapement (millions)	5.326	2.271	12.850	3.849	9.707	6.753	4.867	8.173	14.1
Freshwater Survival	9.2%	11.7%	18.4%	11.1%	9.7%	12.7%	15.7%	18.7%	16.0%
Marine Survival	3.7%	0.8%	4.7%	1.6%	5.0%	2.8%	1.7%	2.9%	3.0%

* See 1977 Annual Report for previous years.

Table 4. Calculated catches and percentage harvest from pink salmon runs entering Convention Waters in 1979.

	Source of Run				Total
	United States	Fraser River	Canada Non-Fraser	Non-Study Area Stock	
Total entering Convention Area	1,964,000	10,631,000	261,000	95,000	12,951,000
Catch in Canadian Convention Waters Westerly of William Head	662,000	3,205,000	88,000	81,000	4,036,000
Easterly of William Head		95,000	1,000		96,000
Total	662,000	3,300,000	89,000	81,000	4,132,000
Percent Harvest	33.71	31.04			
Catch in United States Convention Waters	167,000	3,713,000	152,000	14,000	4,046,000
Percent Harvest	8.50	34.93			
Total Catch in Convention Area	829,000	7,013,000	241,000	95,000	8,178,000
Percent Harvest	42.21	65.97			

The 1979 catch in Convention Waters was 8,177,628 compared with 4,243,908 in 1977 (Appendix Table XI). The division of catch was Canada 4,131,355 (50.52%), and the United States 4,046,273 (49.48%).

In 1979, as in 1977, the major feature of the fishing season was the large catch of pink salmon made by the coastal troll fishery. In Canadian Convention Waters the troll catch was the largest on record, 1,546,753, and formed 37.4% of Canada's catch in Convention Waters. The percentage taken in 1979 declined from the record of 47.6% in 1977. The percentage of the total catch made by purse seines increased to 60.1% in 1979 showing a significant improvement compared to the low percentage of 38.9% taken in 1977. The total purse seine catch of 2,480,864 was the largest since 1963. The gill net catch of 103,738 pink salmon was the lowest of any year on record and comprised only 2.5% of the catch.

The vast majority (97.7%) of the Canadian Convention Waters catch was made westerly of William Head with troll gear accounting for 38.0% of the total, purse seines 61.5% and gill nets 0.5%. The percentage of the total catch taken in the western area was the largest ever. The gill net catch of only 81,628 pink salmon in District I was the lowest ever as was the percentage of total catch (2.0%).

Associated with the large Convention Waters troll catch of pink salmon there also was a record catch of pinks taken over the entire Washington and Vancouver Island coasts during 1979 (Table 5). (In the United States, the Territorial Waters and Fishery Conservation Zone were closed to fishing for pink salmon during the month of June by governmental action, and the Canadian Government placed a coast wide 25% retention limit on troll catches of pink salmon from July 5 to July 28.) With increasing efficiency of the troll fishery the numbers of fish and percentage of the runs taken on the high seas has increased dramatically since 1957, rising from 278,000 in that year to 3,744,000 in 1979 and from 5.1% to 37.0% for the respective years.

Table 5. Pink salmon catches inside and outside of Bonilla Point Line.

Year	Convention Waters Inside Catch	Washington-B.C. Coastal Troll Catch (Grays Hrbr.-A.27)	Troll Catch % of Inside plus Coastal Catch
1957	5,205,072	278,433	5.08%
1959	4,378,255	497,133	10.20
1961	935,618	219,792	19.02
1963	7,749,018	1,211,612	13.52
1965	1,004,454	217,382	17.79
1967	6,870,349	1,709,281	19.92
1969	1,553,058	567,872	26.77
1971	4,075,316	989,151	19.53
1973	3,856,001	869,124	18.39
1975	2,263,206	685,875	23.26
1977	3,097,975	2,030,863	39.60
1979	6,366,652	3,744,000	37.03

In United States Convention Waters, purse seines caught 3,354,044 pink salmon, the largest catch since 1963. The purse seine catch was 82.9% of the total United States Convention Waters catch, the highest percentage since 1967 (83.7%) but no major change from that recorded in the intervening years. Although the gill net catch was the highest number of any year (388,723) the percentage taken by this gear (9.6%) was only slightly better than in 1977 (9.1%). Reef nets captured 42,771 pink salmon which was an improvement compared with 1977 (30,069), however the percentage taken (1.1%) was the lowest ever. The troll catch of 260,735 was the largest since 1963 and the percentage taken (6.4%) was similar to 1977 (7.5%).

One of the major management problems confronting the Commission during the pink salmon season was determining Fraser River run size. The average weight (4.8 lbs.) of pink salmon was the smallest on record and this suggested a large return based on the established inverse relationship between size of pink salmon, and run abundance (Figure 4). In addition to the small size of pink salmon, the outside troll fisheries (including Johnstone Strait) were taking a record of nearly 4 million pinks. In addition it was difficult to determine on a daily basis the magnitude of the daily coastal troll catches over the entire coast. As the pinks entered the Juan de Fuca Strait net fishing areas, record catches were made, the largest of which totalled 623,000 pink salmon in the Area 20 fishery on August 25. The previous record catch of 405,000 in this area had been made in 1963. Analyses of all these data compared with other years indicated a 1979 Fraser River run size of at least the predicted level (15,000,000) and possibly much larger. This can readily be seen from comparison of daily catches in Area 20 in 1967 and 1979 when the 1967 Fraser run was 12,850,000 (Figure 5). Daily catches in United States waters were the largest since 1947. The run size projections from catch data were dependent upon a number of factors. One of them was the assumption that a normal percentage (around 30%) of the total Fraser pink run was approaching the Fraser River via the northern route through Johnstone Strait. Because of technological changes implemented in the purse seine fishery in Johnstone Strait in 1979, it was difficult to evaluate the catches made in that fishery this year compared to other years. From analysis of all these data it became apparent that only about 17% of the total Fraser pink run came through Johnstone Strait and this contributed to large catches in the southern approach areas and overestimation of run size. Therefore, major closures were implemented in the Convention Waters net fisheries after the peak of the run in order to provide the desired escapement.

During the extra days fishing granted to certain United States Indian tribes by the United States Government, approximately 404,000 pink salmon were caught.

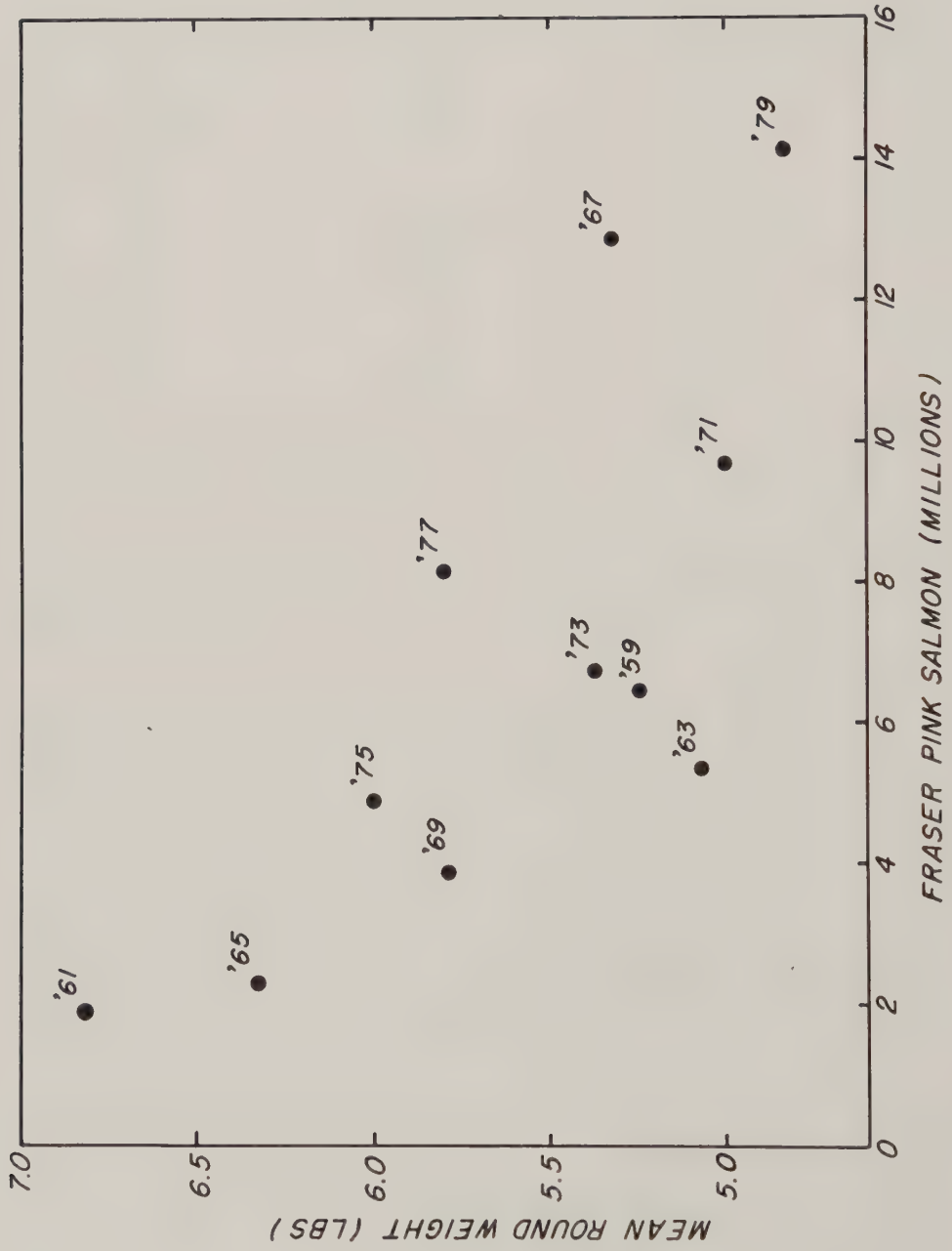

Figure 4. Numbers of Fraser pink salmon vs. purse seine mean weight in Area 20.

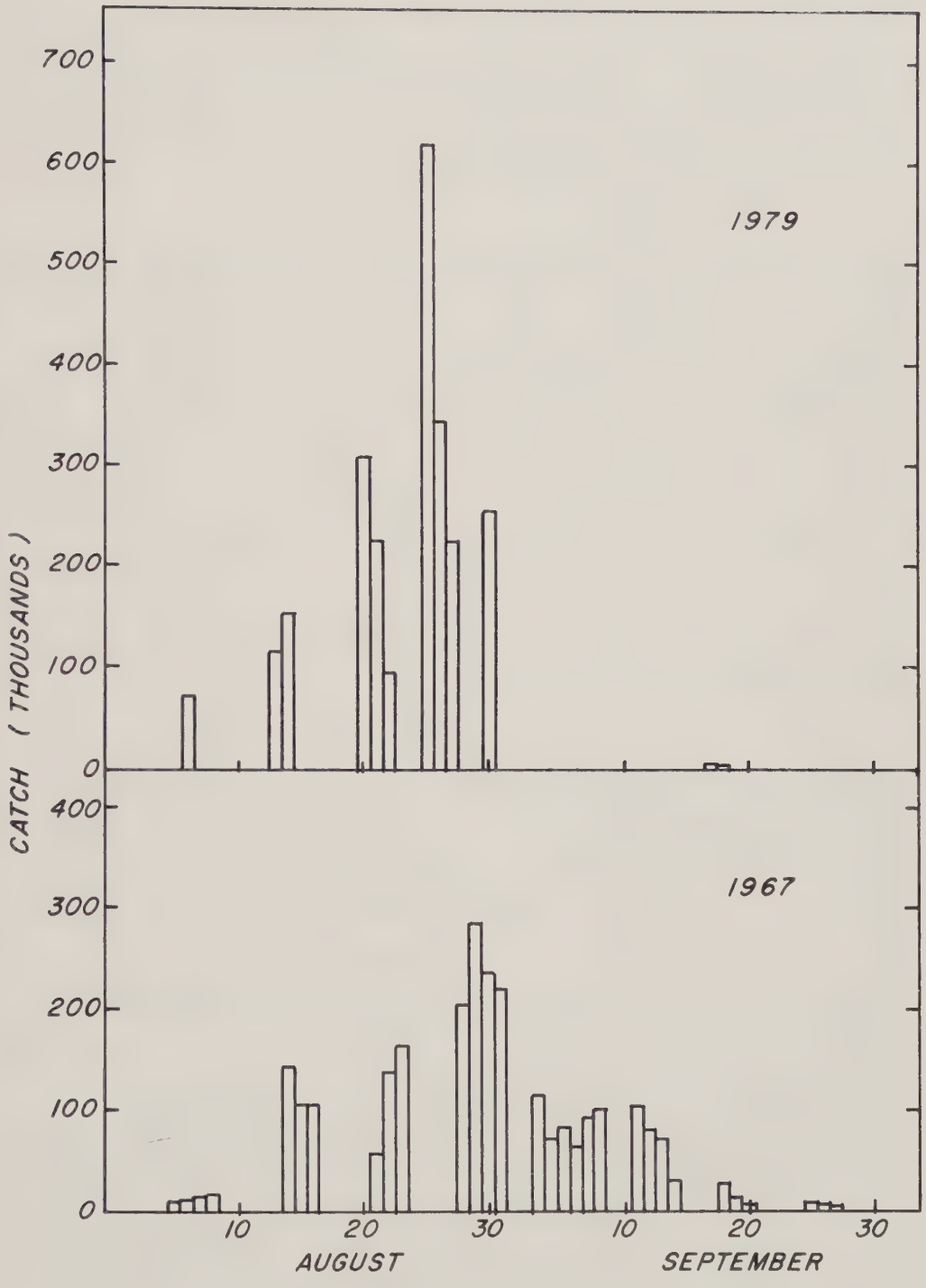

Figure 5. Area 20 pink salmon catches 1967 and 1979.

Escapement

The total 1979 net escapement of pink salmon to the Fraser River spawning areas was 3,560,654 fish (Appendix Table XIV), or about 25.3% of the total run. In addition, an estimated 59,261 were caught in the Fraser River Indian Fishery making a total gross escapement of 3,619,915, the largest escapement on record. From a total run reaching Convention Waters (10,631,000), 33.5% arrived at the spawning grounds.

The Early run escapement of 3,154,945 was the largest on record. It exceeded the previous maximum recorded in 1977 by almost one million fish. The Early run is composed primarily of three main segments, namely the population on the Thompson River, Seton Creek and Main Fraser River below Hope. The numbers of pink salmon migrating above Hell's Gate has increased dramatically in recent years from only about 132,000 in 1961 to about 1,600,000 in 1979. The 1979 escapement to these areas was the largest on record and was probably the largest since 1911. The Thompson River escapement of 885,402 was down from the record 972,941 observed in 1977. There is still area available for many more spawners in the Thompson River as well as in the Nicola River where only about 2,000 spawners were observed. A very large escapement entered Seton Creek with a total of 549,512 pink salmon enumerated. This was the largest escapement on record. A total of 44,450 additional pinks entered the two spawning channels. A record escapement into Portage Creek and Bridge River of 51,842 and 65,759 respectively was also observed. Gates Creek also had 1,277, the largest number to date. The total escapement into the Seton-Anderson district was 712,840. The largest escapement on record was also observed in the main Fraser River segment of the Early run with 1,521,856 fish. The previous largest escapement since enumeration began in 1957 was 1,264,000, in that year. The main Fraser spawning area contains a vast area for spawning.

Significant improvement was noted in the Late run escapements in 1979 with total escapement of 405,709 compared to only 186, 409 in 1977. The 1979 escapement was the largest since 1973 and was the result of extensive fishery closures on the latter portion of the Fraser run. In the Harrison River the escapement increased from 126,782 in 1977 to 269,858 in 1979 and in the Chilliwack Vedder River there were 124,041 spawners in 1979 compared to only 48,561 fish in 1977. The Late run escapement in 1979 formed 11.4% of the total escapement which showed a definite improvement compared to the record low of only 7.8% in 1977.

Spawning conditions in all Early run areas were excellent during the spawning period. During the fall heavy rains caused freshets in the lower Fraser area which may have had some effect on fry production from Late run spawning.

The total escapement in 1979 was 1,172,843 larger than in the brood year (1977) and this represented a 49.1% increase in escapement. However, because of the smallest sized fish on record and corresponding low fecundity, the total numbers of eggs deposited was only 27.8% larger than in the brood year increasing from 2.960 billion in 1977 to 3.788 billion in 1979 (the largest on record). The known smaller size fish in 1979 and associated low fecundity was a major consideration in the management scheme with respect to escapement during the season. The record egg deposition gives the potential for increased production of pink salmon in 1981, but the actual return will depend on survival rates of both eggs and fry. The 1979 adult return shows that the optimum number of spawners and eggs has not been reached, and depending on the results of the 1979 spawning, it appears probable that further increases in escapement would be justified.

Stocks of pink salmon destined for areas other than the Fraser River are found in Convention Waters and the escapements into Canada non-Fraser rivers located north of the Fraser River and into Puget Sound rivers in Washington State were in general similar to the levels recorded in the brood year (1977) (Appendix Table XV).

SPAWNING CHANNEL OPERATIONS

Fry production from the 1978 spawning of sockeye salmon at channels operation by the Commission is given in Table 6.

Table 6. Sockeye fry production from the 1978 brood at spawning and incubation channels

Site	Eggs Deposited	Fry Produced	Survival %
Upper Pitt	4,953,000*	3,543,000	71.5
Weaver Creek	75,148,000	40,978,000	54.5
Gates Creek	278,000	200,000	71.9
Nadina River	4,371,000	2,818,000	64.5

* Eggs taken

At the Upper Pitt River incubation channel the number of eggs taken was the largest since start of operations, and the number planted was the second largest. The survival from eggs planted to fry was 78.2%. At the Weaver Creek channel the number of eggs deposited was the second largest since start of operations, and the number of fry was also the second largest. The accumulated data now suggest that maximum adult returns would be obtained with a combined fry output from Weaver Creek and the channel of 20-25 million fry, and, until proven otherwise, operation of the channel now will be planned with this objective. At the Gates Creek channel the number of fry produced was over double the number (84,000) on the previous cycle, continuing the growth of this smallest of the four cycles. At the Nadina channel the number of fry produced was nearly three times the number (1,001,000) in the previous cycle, continuing the growth on this smallest cycle year at Nadina.

The total Pitt River sockeye return in 1979 was estimated at 129,000, of which 40,000 was produced by the incubation channel (Figure 6). The run was the fourth largest recorded, and about 65% of it was five-year-old returns from the 1974 brood year. The total Weaver Creek sockeye return in 1979 was estimated at 157,000, of which 97.5% (153,000) was produced by the spawning channel (Figure 7). This was the second largest run recorded on the cycle (Figure 8). The total Gates Creek run in 1979 was estimated at 18,500 sockeye, of which 17,500 were produced by the spawning channel. This was a substantial increase from the brood year (10,700) and was the largest run recorded on this subdominant cycle. The total Late Nadina run in 1979 was estimated at 301,000 sockeye. This was over four times larger than the brood year (69,000) and was the largest recorded in any year. The spawning channel produced 87.4% of this run.

The number of eggs taken for the Upper Pitt incubation channel in 1979 was 4,631,000. At the Weaver Creek channel the number of sockeye spawners in the channel (20,598 adults) was purposely limited to about the optimum number for maximum production. At the Gates Creek channel the number of adult spawners doubled from 1,612 in 1975 to 3,256 in 1979.

Because of only 64% success of spawning in 1979 the effective increase was approximately 1.4 times the brood year. At the Nadina River channel, the number of spawners (41,207 adults) was nearly four times the brood year (11,296), but because of a prespawning loss of 45%, attributed to a parasitic infection described elsewhere in this report, the number of effective female spawners (12,591) was about twice the number (5,742) in the brood year. First returns to the Nadina River channel now have been obtained on three of the four cycles, and the number of spawners for these returns has increased two to four times over the brood years.

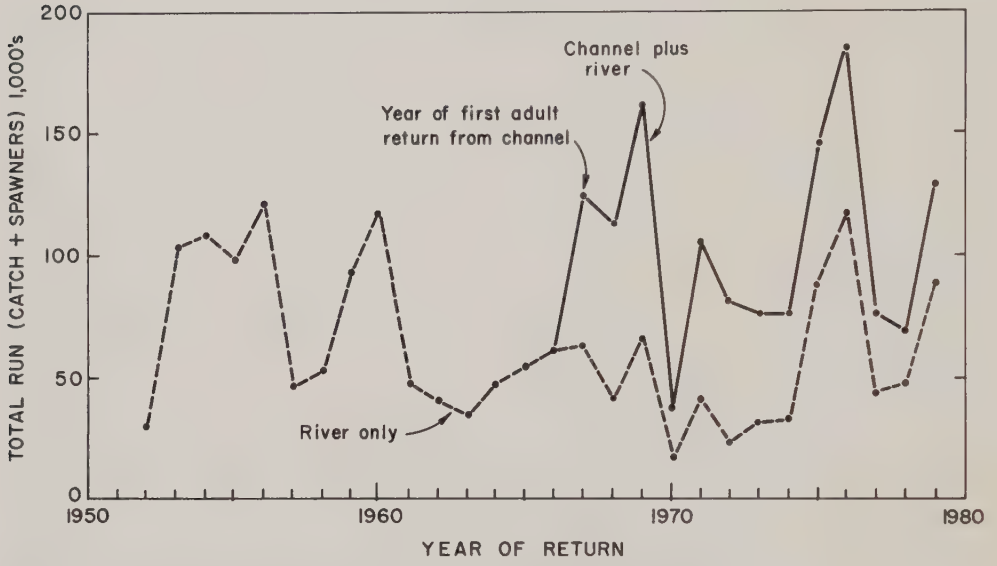

Figure 6. Sockeye production from Pitt River and Pitt River incubation channel, 1952-1979.

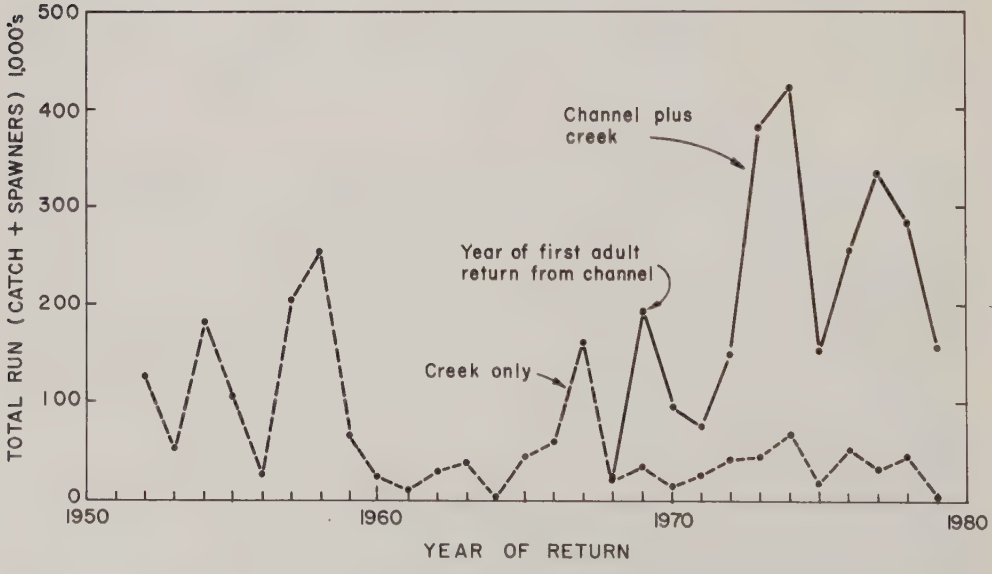

Figure 7. Sockeye production from Weaver Creek and Weaver Creek channel, 1952-1979.

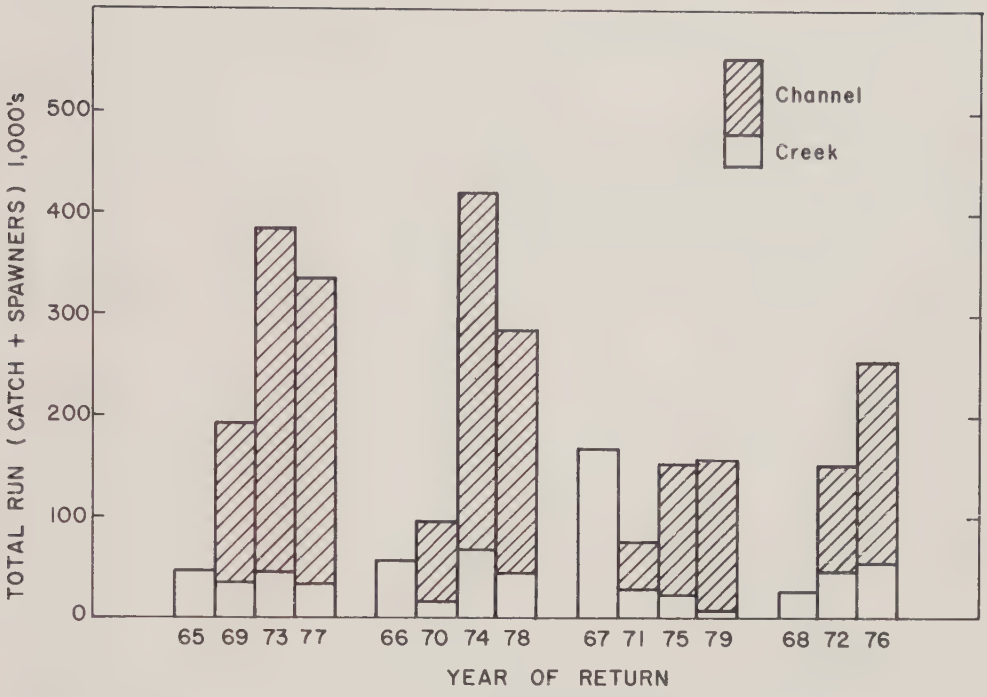

Figure 8. Sockeye production from Weaver Creek and Weaver Creek channel, by cycles, 1965-1979.

RESEARCH

Research emphasis continued to be directed toward the lacustrine stage of the life cycle of sockeye salmon. As previously reported, acoustic techniques are employed to assess juvenile sockeye populations in the major rearing lakes. The analyses of data for fourteen lakes surveyed in 1978 was completed in 1979 aided by computer analyses at the University of Washington. The major sockeye populations were in Quesnel, Takla, Trembleur and Stuart Lakes, totalling about 95 million fingerlings. The surveys also disclosed the presence of large numbers of other fish (primarily stickleback and smelt) totalling approximately 400 million fish for the 14 lakes. Very large populations of smelt and stickleback were found in Pitt and Harrison Lakes which may affect the capacity for rearing of sockeye.

Due to budget limitations the lacustrine studies in 1979 were limited to a few selected lakes.

The study of distribution, feeding and growth of sockeye in Pitt Lake continued in 1979. The sockeye made an early migration to the pelegial zone in the lower end of Pitt lake, and contrary to the observations in 1978 reported last year, the sockeye were found in the lake during the remainder of the year. The reason for the apparent difference in behavior of the fish in these two years is not known, nor are the implications to the fishery known.

In the past it has been difficult to assess the sockeye population in Harrison Lake because of the very dense populations of smelt and stickleback intermixed with the sockeye. However in 1979 it was possible to identify the majority of the sockeye because they were concentrated in a lower strata of the lake (Figure 9).

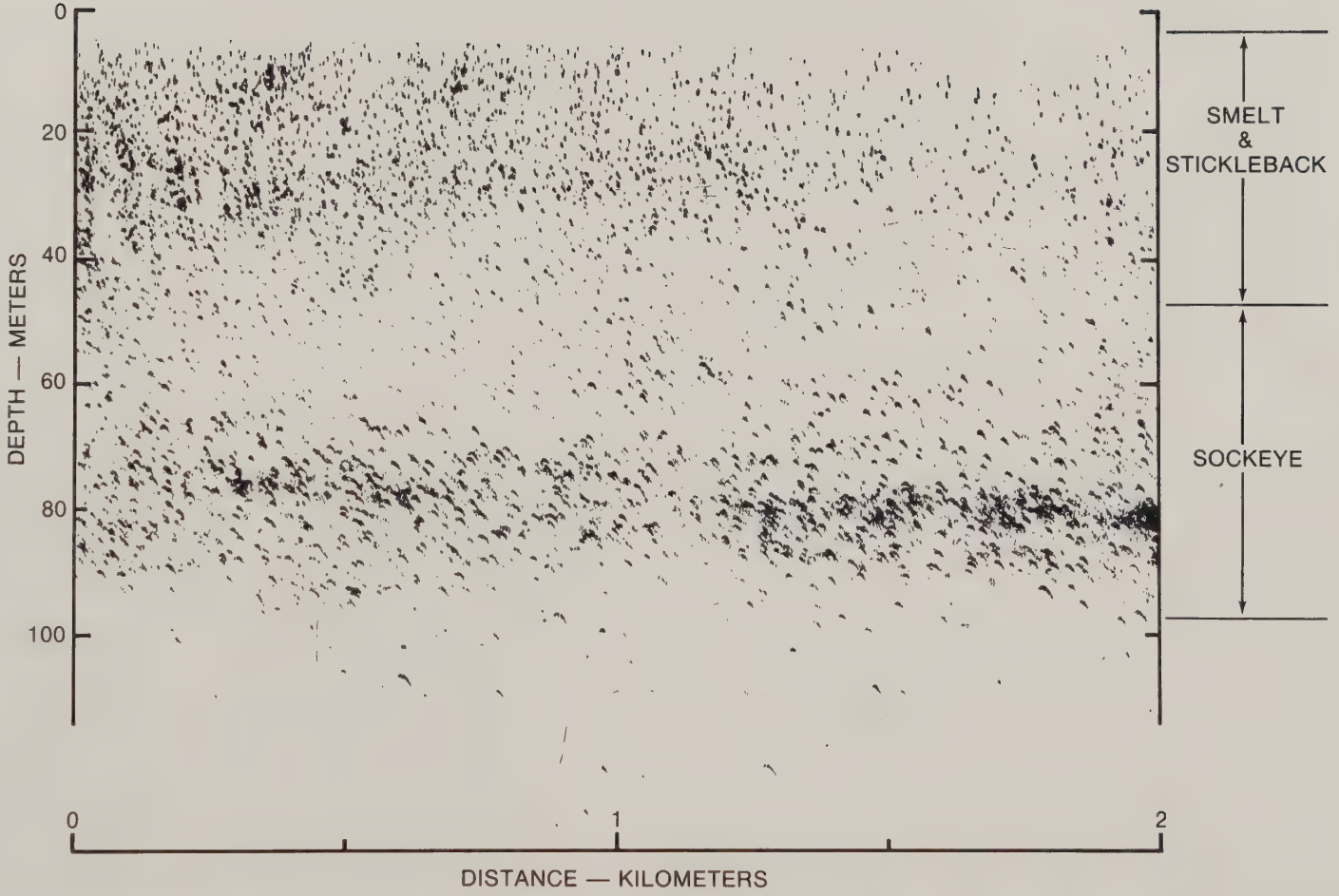

Figure 9. Echogram showing separation of sockeye from smelt and stickleback in Harrison Lake November 26, 1979.

The standing crop of zooplankton, water conductivity and transparency were measured on Cultus, Pitt, Harrison, Chilliwack and Shuswap Lakes. No significant changes were found, compared to previous years data.

Surveys of the dominant cycle fry population in Shuswap lake showed a dense population of sockeye fingerlings (Figure 10) with somewhat more fingerlings per adult spawner than in the brood year. A more detailed study was carried out to obtain data on feeding behavior of sockeye fry. Feeding sockeye, located using the echo sounding technique, were sampled with a tow net and Clarke-Bumpus plankton samples were taken from the depths at which the trawls were made. These data will provide information on the feeding behavior of sockeye in situations of high fry densities.

Investigations into the feasability of short term rearing of sockeye were continued in 1979. In the spring of 1979, 372,000 fry were released into Cultus Lake without feeding. Other fry were held and fed for periods ranging from 10 to 90 days with 91% survival and 110,000 of these fry were released into Cultus Lake. It is anticipated that the total fry release will help boost production of the Cultus sockeye run on this cycle.

In the fall of 1979,500,000 Cultus sockeye eggs were taken for studies of short term rearing of sockeye.

In the spring of 1977 approximately 120,000 sockeye smolts were exposed to very small amounts of morpholine as they migrated down Sweltzer Creek to determine if 5 to 7 hour exposure would be sufficient to result in imprinting. The response of the returning adults to morpholine in 1979 indicates the short exposure was insufficient to result in imprinting.

An unusual prespawning mortality occurred in the Late Nadina River sockey run in 1979, with a 45% loss in the spawning channel and 19% loss to those sockeye using the river area. These losses are the highest ever observed for this run. From 1950 to 1978, losses in the natural spawning area averaged 3.8% with a high of 18.8% in 1963, and from 1973 to 1978 losses in the spawning channel average 5% with a high of 12.9%.

Examination of the fish revealed the presence of a common freshwater parasite *Ichthyophthyrius multifilis*. There are reports of this parasite having been observed on salmon in artificial and natural holding areas in Washinton State, and in one case it was considered the cause of prespawning loss in a spawning channel.[1] The life cycle of the parasite is relatively short, ranging from as little as 4 days at 70°F to 30 days or longer at 50°F. The mature parasites drop off the fish to the bottom where they produce up to 1000 young parasites. These then seek out a fish host and the cycle is repeated.

A heavy infestation of the parasite was observed on the Nadina channel sockeye that died unspawned and substantial gill damage could be seen with the unaided eye. Microscopic examination of the gills revealed very few bacteria of the types usually associated with gill disease, but heavy concentrations of the parasite (Figure 11). Microscopic examination of the skin showed various stages of the parasite burrowing into the skin. Such physical damage to the gills can cause an imbalance of electrolytes and also interfere with oxygen tranfer to the blood. Physical damage to the skin can also cause an imbalance of electrolytes. It is not known if these circumstances would prevent maturation of the eggs in the female. Most of the females that died unspawned had tight egg skeins in spite of a longer than average

1 Wood, James W. 1968. Diseases of Pacific Salmon; Their Prevention and Treatment., Washington State Dept. Fish.

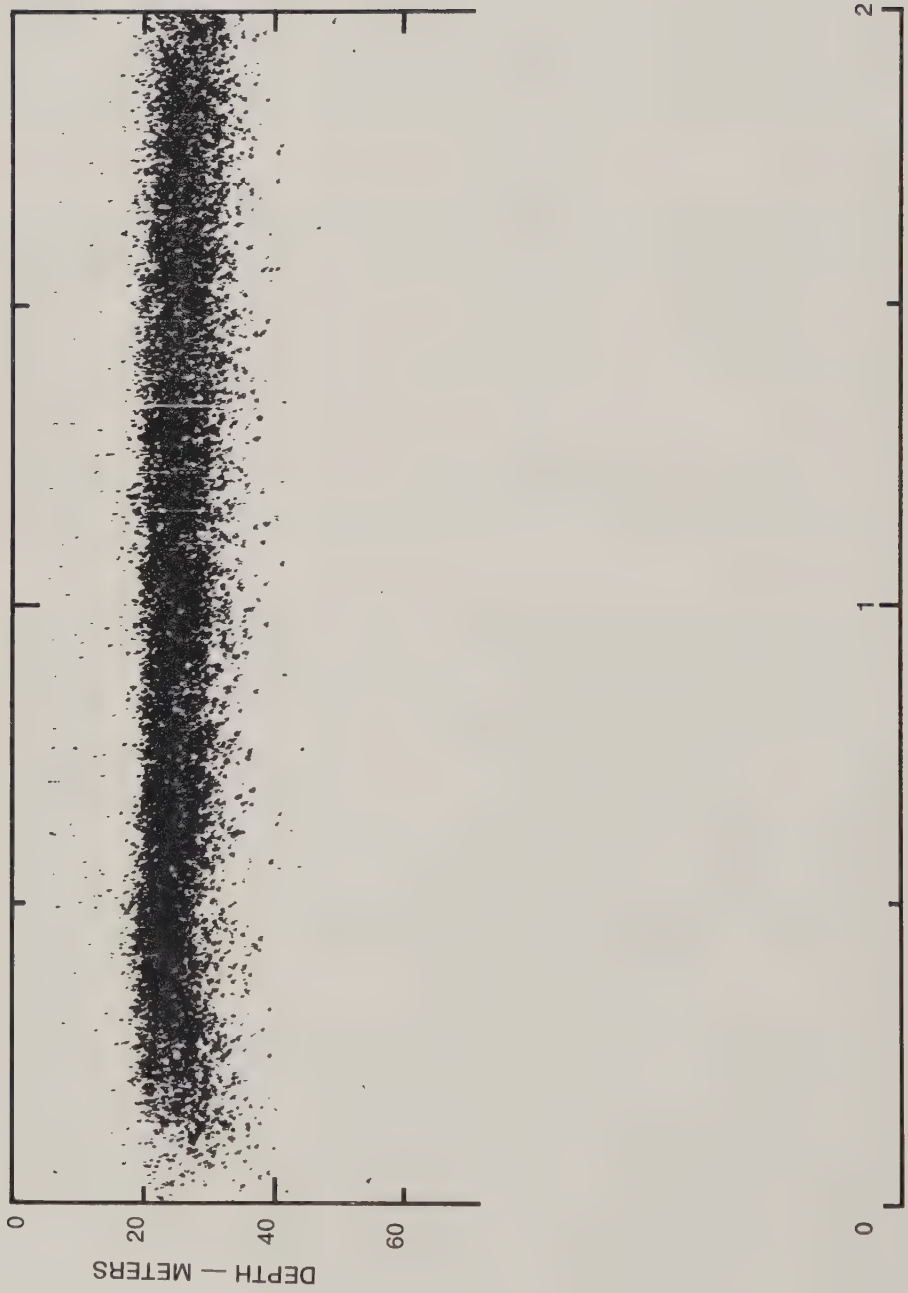

Figure 10. Echogram showing juvenile sockeye in Shuswap Lake October 18, 1979.

lifespan on the spawning grounds. Therefore it was not possible to attempt egg salvage as was done in 1976 at the Gates Creek channel.

The 1979 Late Nadina run reached the spawning grounds earlier than any other year on record. The escapement of nearly 56,000 to Nadina River this year was the largest ever recorded, and while much of the available spawning grounds was not heavily spawned, there were concentrations of fish, particularly at the upstream end of the channel, which probably aided the parasite infestation. This could explain why the percent loss of spawners was greater in the channel than in the river, even though water temperatures in the channel, with a maximum of 65.5°F, were lower than in the river. Water temperatures in the Nadina River were high, reaching a maximum of 71°F when the first fish reached the area, and this may have contributed to prespawning loss as well as to the parasite epizootic. Very likely early timing, high river water temperature, and the parasite all contributed to the unusual loss this year. The source of the parasite is not known. It was not observed in the Stellako River sockeye nor was it reported on any resident species in Nadina Lake. Remedial measures which can be taken in future to prevent or control an outbreak are being investigated. These include prevention of crowding of salmon at the top end of the channel and prophylactic treatment of the water.

The Stuart and Nechako Rivers were surveyed by boat from Fort St. James to Prince George during the passage of the 1979 Early Stuart run. Water levels were higher than in 1978 making observations of migrating sockeye more difficult. River temperatures ranged from 64 to 66.5°F during the survey. Six dead sockeye were examined in the first 20 miles of the Stuart River below Fort St. James. In addition one sockeye was recovered in the Nechako River just below the confluence of the Stuart and Nechako Rivers. The carcasses were too deteriorated to determine cause of death.

The cold brand method of marking adult sockeye studies in 1978 was used in 1979 to study the Early Stuart sockeye run as it entered the Fraser River. One serious shortcoming not revealed by the 1978 studies at Cultus Lake was observed at the spawning grounds, where it was found that brands had penetrated the skin and exposed flesh. The brand does not appear to be suitable for application to sockeye except near the spawning grounds.

The possible uses of environmental factors to predict the return of sockeye and pink salmon continues to be examined. The marine survival of the 1979 Fraser River pink salmon run was 3.0% from the fry produced by the 1977 brood. The prediction based on salinity at Amphitrite Point was 3.2% with a range from 2.4% to 4.5%. The prediction based on five other environmental indices, primarily river discharge, was 3.8% with a range from 3.4% to 4.0%. The 1979 survival showed the importance of incorporating environmental factors from the outer coast of Vancouver Island in the prediction.

Predictions of the abundance of many Fraser River sockeye runs is based to a considerable extent on the number of $^{3}_{2}$ sockeye returning in the preceeding year, used in conjunction with previous data on the ratio of the number of four year old sockeye to the number of three year olds. This ratio varies between stocks but the relationship between it and number of $^{3}_{2}$ also is subject to considerable variability. Data obtained from the scales of the three year old fish had been used to help assess this variability. New analyses indicate that for some stocks, ocean temperatures during the first year at sea may also help explain some of the variability.

Figure 11. Ichthyophthyrius multifilis parasites attached to gill filaments of Nadina River sockeye (x 86).

A method of forecasting the timing of Fraser sockeye and pinks was outlined in the 1978 Annual Report. The method gave mixed results during the 1979 season when the pinks and most sockeye stocks did not show the very late return of the peak numbers as predicted by ocean temperatures. However, many sockeye stocks did show very late timing of the latter portion of their return. It appears that more attention may have to be given to the effects of relatively localized ocean temperature anomalies.

ENVIRONMENT CONSERVATION

In 1977, the B.C. Pollution Control Branch issued a discharge permit for Annacis Island sewage treatment plant which specified primary treatment and set limits on a wide range of substances including toxic materials. In keeping with recommendations of a Cabinet Committee, the permit included the following provisions:

a) The effluent shall meet Level BB Objectives for toxicity; equivalent to 1.33 toxic units.

b) A source control program to reduce disposal of toxic materials to municipal sewers shall be expanded to include the entire Greater Vancouver Sewerage and Drainage District.

c) Testing of chemical, biological and other secondary treatment alternatives was to be conducted to determine the most cost-effective alternative for the plant.

In September, 1979, the B.C. Pollution Control Board announced that an inquiry would be conducted in February 1980 to determine whether compliance with provisions of the discharge permit had been achieved. In addition, the Board announced it would hear evidence to determine if the current Pollution Control Objectives for Municipal Type Waste Discharges in British Columbia are adequate to protect the lower Fraser River from a polluted condition. The Commission cooperated with the Canada Department of Fisheries and Oceans and Environmental Protection Service in preparation of briefs to the inquiry.

Studies conducted at Annacis Island by the Commission in 1976, prior to issuance of the discharge permit, showed that toxicity of primary effluent to sockeye salmon ranged from 2.2 to 5.9 toxic units in the absence of residual chlorine. Source control had been expanded since the discharge permit was issued but on the other hand, new discharges were added to the collection system tributary to Annacis Island and the primary treatment system remained unchanged. To assess the net impact of these developments the 1976 study was repeated in November, 1979 and the data included in the Environmental Protection Service brief to the Pollution Control Board inquiry.

In summary, the data obtained in autumn, 1979, for grab samples, 24 hour composite samples and continuous flow on-site tests all indicated that effluent free of chlorine at Annacis Island failed to meet the criterion of 1.33 toxic units as specified in the April 1977 discharge permit. Comparison of data obtained in 1976 and 1979 indicated no significant change in acute toxicity. Thus there was no evidence from acute toxicity data to suggest that a trend toward meeting level BB Objectives had taken place.

The aquatic weed, Eurasian water milfoil, *(Myriophyllum spicatum)* was first documented in Cultus Lake in 1977. Surveys by the Water Investigations Branch of the B.C. Ministry of Environment documented spread of Eurasian milfoil to most shoreline areas of the lake in 1978. The amount of Eurasian milfoil reported in some areas of the Lindell Beach sockeye spawning grounds increased from sparse in 1978 to moderate in 1979. However, there was no evidence that Eurasian milfoil interfered with spawning in 1978 or 1979. To control Eurasian milfoil in Cultus Lake a local ad hoc committee arranged for testing of a diver-operated suction dredging program in October 1978 to remove plants and roots. Testing resumed in 1979 and 90-95% of the Eurasian milfoil was removed from areas dredged but funding was exhausted before all infested areas were treated. Dredging was

scheduled to avoid interfering with spawning or fry emergence. Measurements showed that lake turbidity was not affected by the type of dredging operation conducted. Regrowth of Eurasian milfoil was evident as some areas which had been dredged in autumn 1978. The committee's plans call for suction dredging in 1980 but with improved equipment to increase speed of the operation.

Eurasian milfoil also occurs in Sweltzer Creek which drains Cultus Lake. Surveys by Commission personnel indicated Eurasian milfoil occurred in back eddies and along the banks of Sweltzer Creek but there was not a noticeable increase in 1979 over the amounts observed in 1977. Spawning of pink salmon in Sweltzer Creek was not affected by Eurasian milfoil in 1977 or 1979.

According to surveys by the Water Investigations Branch, milfoil infestations of ponds, lakes and sloughs in the Fraser Valley have not spread noticeably. Although Eurasian milfoil occurs in lakes of the Okanagan Valley, it has not been observed during surveys of Shuswap and Mabel Lakes immediately to the north.

Although mechanical methods were applied to control Eurasian milfoil in Cultus lake, alternative proposals include treatment with the butoxyethyl ester (BEE) of the herbicide 2, 4-D. This herbicide is applied in the form of clay granules impregnated with BEE and is called Aqua Kleen 20. In view of possible proposals to control Eurasian milfoil on the Fraser watershed by application of Aqua Kleen 20, research was conducted in 1978 at Sweltzer Creek Laboratory to measure toxicity of BEE to eggs, fry and smolts. Details of the study are reported in Progress Report No. 40.

Prior to 1975, bathing beach areas of Cultus Lake were treated annually with copper sulfate to kill snails which serve as hosts to the organism which causes "swimmer's itch". Treatments were conducted by the Cultus Lake Parks Board prior to sockeye smolt migration and fry emergence under supervision of a Fisheries Officer and within constraints specified by Fisheries and Oceans. This method of controlling swimmer's itch came under review of the Interdepartmental Pesticide Committee and was not done in 1975 pending studies from 1976 to 1978 to evaluate the method. In summary, the studies determined that there was no significant reduction in the incidence of "swimmer's itch" in the year when copper sulfate was applied (in 1978) as compared to the previous two years when the lake was not treated. As a consequence, the study committee recommended that copper sulfate treatment of Cultus Lake for control of "swimmer's itch" not be undertaken in the future.

The first kraft pulp mill on the Fraser River watershed commenced operation at Kamloops in late 1965. This was followed by three kraft mills at Prince George and one at Quesnel making a total of five. The mill at Kamloops has since expanded production from 250 to 1,250 tons per day. In 1979 Northwood Pulp and Timber at Prince George announced plans to expand production from 744 to 1,605 tons per day by mid 1982. In addition, engineering studies concerning a proposal to construct a thermomechanical pulp mill at Quesnel were reported underway in 1979. A thermomechanical pulp mill produces groundwood pulp using heat and mechanical methods. Reports in the technical literature indicate that effluents from mechanical pulping are amenable to detoxification by methods such as the aerated lagoons used to detoxify kraft effluents. The Commission in cooperation with the Canada Department of Fisheries and Oceans and the Environmental Protection Service will be examining these proposals for expansion to assure that sockeye and pink salmon are being protected.

Effluent from Cariboo Pulp and Paper Co. Ltd. at Quesnel failed to meet effluent specifications, including toxicity, in March and April. Failure of the two aerated lagoons operating in series to meet specifications was attributed to an excessive pollution load caused by mechanical problems and human oversight in the mill. In addition, the final aerated lagoon was operating at less than capacity since two of the aerators were not in service. Treatment efficiency and detoxification reached normal levels by mid-May.

Treated effluent at the Weyerhaeuser Canada Ltd. pulp mill at Kamloops failed to meet detoxification criteria during the first three weeks of June. Failure of the five-day aerated lagoon to meet treatment specifications was caused by an excessive discharge of black liquor to the aerated lagoon during the first week of June. The loss of black liquor was attributed primarily to mechanical problems and partly to human error. A portion of the black liquor, mixed with a high volume of bleach plant wastewater, was directed to the emergency spill pond but when its capacity was used the remainder drained to the aerated lagoon. Various corrective measures have been adopted to prevent such a loss of black liquor from re-occurring.

The pulp mill at Kamloops was directed by the Pollution Control Branch to undertake studies to reduce the amount of color discharged to the Thompson River. In the 1978 Annual Report it was reported that oxygen bleaching was tested but performance was not adequate. Further study and modifications were not successful and the problem remained unresolved, but further testing was planned.

Under terms of its Pollution Control Branch discharge permit the Kamloops mill was directed to conduct physical, chemical and biological monitoring programs in Kamloops Lake, Thompson River, plus the North and South Thompson Rivers. A report of the 1977-78 monitoring program suggested that benthic algal growths in the Thompson River downstream of Savona was less in 1978 compared to 1973-75 when growths were heavy. Observations by Commission field personnel during enumeration of pink salmon in autumn 1979 indicate algae growths were unchanged from 1977 but less than in 1975.

Effluent from Belkin Paper Ltd. on the North Arm of the Fraser River failed to meet Pollution Control Branch detoxification objectives during 1979. In addition, the Environmental Protection Service estimated the discharge of polychlorinated biphenyls (PCB'S) at 0.27 to 5.34 pounds per day. Effluent quality is expected to improve when in-plant facilities designed to reuse wastewater and reclaimed fiber are completed by mid 1980.

Expansion of the Hemlock Valley ski resort at the headwaters of Sakwi Creek continued in 1979. Sakwi Creek is a tributary of Weaver Creek at the sockeye spawning area and forms part of the water supply for the spawning channel. Development of the ski resort and the accompanying subdivisions are under authority of the B.C. Land Management Branch. Roads to and in the resort area are maintained by the Department of Highways. In the interest of minimizing potential effects on Weaver Creek spawning channel and natural spawning grounds, the Commission participated with the Department of Fisheries and Oceans in an interagency committee formed in October 1977 to review drainage plans for the ski resort. Through review of plans, on-site inspections and water quality monitoring, recommendations for revisions and corrective action in Hemlock Valley and along the access road were made in 1978 and 1979.

The Sakwi-Weaver drainage was subjected to high runoff caused by heavy rain and melting snow in mid-December, 1979. Inspection during the storm indicated erosion was minimal in the resort area but washouts occurred along the access road, some of which contributed silt to Sakwi Creek. The Weaver Creek spawning channel was not affected but the natural spawning grounds in Weaver Creek downstream from Sakwi Creek were scoured due to high velocities.

Under terms of a Pollution Control Branch discharge permit, sewage from the resort area at Hemlock Valley is treated and discharged via pipeline to Maisal Creek in the Chehalis River drainage.

In response to proposals for logging in the Nadina River watershed the commission initiated a water sampling program in September 1975 to establish backgrounds levels of water quality before road building and logging commenced. The sampling program has expanded with additional proposals for logging to include 29 sites on the Nadina River and tributaries, including tributaries to Nadina Lake. Physical characteristics of water samples collected in 1975, 1976 and 1977, before road building or logging commenced, indicated water from Nadina River and tributaries was low in sediment in spite of rain or spring freshet. In 1978 and 1979 silt laden runoff was documented in two tributaries receiving runoff from construction of logging roads. The water sampling program is continuing.

Through cooperative arrangement with the Department of Fisheries and Oceans and Environmental Protection Service, applications for effluent discharge permits and refuse disposal permits were reviewed, and recommendations for protection of sockeye and pink salmon were made.

ENGINEERING

Significant progress was made in 1979 towards eventual solution of the long-standing problem of delay, injury and mortality of adult sockeye at the Seton Creek hydroelectric plant. British Columbia Hydro and Power Authority financed further studies of fish passage problems associated with the plant. Studies in previous years showed that adult sockeye migrating upstream to spawning areas in Gates and Portage Creeks remain for long periods in the tailrace of the power plant, where they are attracted to the flow of about 4,000 cfs of Seton Lake water. A flow of 400 cfs of Seton Lake water is discharged down Seton Creek to attract fish past the powerhouse tailrace but this flow is mixed with a variable flow issuing from Cayoosh Creek, a tributary stream entering the Seton system downstream from Seton Lake as shown in FIGURE 12.

Experiments in past years showed that the proportion of fish migrating past the tailrace was increased when fish bypass flows of more than 400 cfs were discharged from Seton Lake. Experiments with Portage Creek sockeye in 1979 showed that all of the fish migrated past the tailrace and reached their spawning grounds when most of the flow of Cayoosh Creek was diverted through the project's unused tunnel into Seton Lake. This diversion increased the Proportion of Seton Lake water in the fish attraction flow in Seton Creek from as low as 52% to an average of 89%.

The experiments conducted in 1979 clearly showed the deterrent effect of a high concentration of Cayoosh water in Seton Creek. Radio telemetry techniques showed that before the Cayoosh diversion was operational fish captured in the tailrace and released in Seton Creek

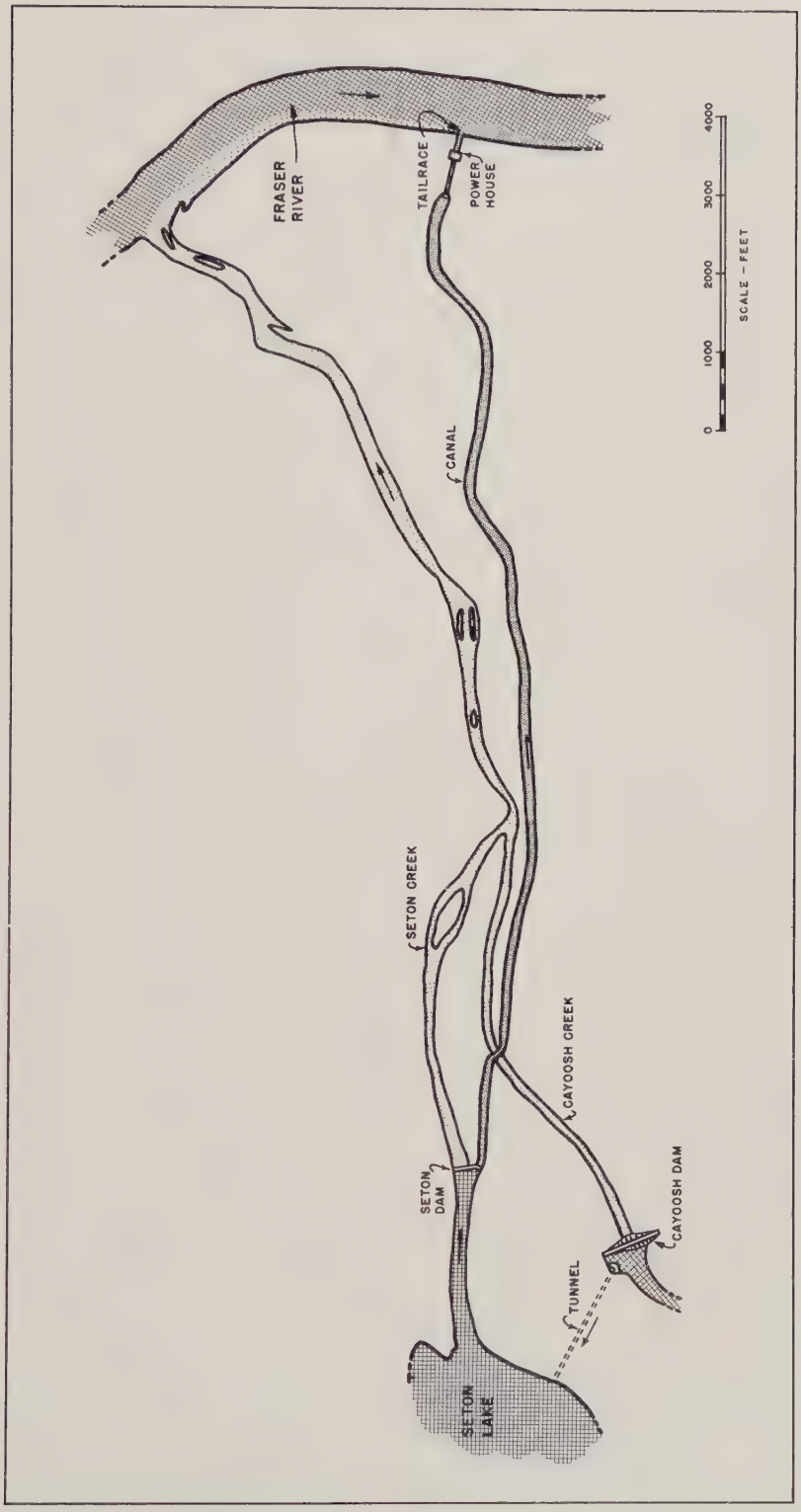

Figure 12. Layout of Seton Creek hydroelectric installation.

below the Seton-Cayoosh junction dropped back downstream, whereas those released in pure Seton Lake water upstream from the Seton-Cayoosh junction migrated upstream without delay. During the Gates Creek run, without the Cayoosh diversion in operation, only 57% of the fish released in the tailrace migrated through the fishway over Seton Dam and the average delay in the tailrace was 89 hours. Later in the year during the Portage Creek run with 76-87% of the flow of Cayoosh Creek diverted into Seton lake, 100% of radio-tagged sockeye released in the tailrace migrated over the dam and the tailrace delay was reduced to 26 hours.

Facilities at the Commission's spawning channels, fishways and laboratory were maintained and improved during the year. Extensive work was again required at the Weaver Creek spawning channel to maintain the natural channel of Weaver Creek downstream from Sakwi Creek. Extreme streambed erosion, as well as deposition of sand, gravel and timber debris, occurs as a result of frequent freshets caused by rainfall in the headwaters of Sakwi Creek. Erosion and gravel deposition during a freshet in the fall of 1978 after completion of sockeye spawning reduced the egg-to-fry survival to only 1.8% below Sakwi Creek. It was necessary to excavate sand and gravel from Weaver Creek during the early fall of 1979 to restore the flood-carrying capacity, to permit installation of the barrier fence for diverting fish to the spawning channel and to enable operation of the species separator and diversion channel. The intake for diverting Sakwi Creek water for use in the spawning channel was also damaged by the 1978 flood and repairs were made prior to its use for the 1979-80 season. Part of the dyke along Weaver Creek protecting the spawning channel was bolstered by placement of additional quarried rock on the face.

As a result of the increases in sockeye and chum populations in Weaver Creek, some fish now spawn in Sakwi Creek where few if any fish formerly spawned. It was therefore necessary to install a small fishway over the intake dam on Sakwi Creek to permit access to the stream above the intake dam. However, most of the eggs deposited in this area in 1979 were probably killed by severe erosion and shifting of the stream bed that occurred after spawning was completed.

At the Gates Creek spawning channel, a new fish barrier fence was constructed for controlling distribution of spawners in the channel and abrasion-resistant steel plates were attached to the barrier fence in Gates Creek to control concrete erosion. Fish attraction from the diversion fence in Gates Creek to the channel entrance was improved by stream bed excavation and riprapping.

At the Pitt incubation channel tests with fluorescein dye showed non-uniform upwelling flow through the beds. It was therefore necessary to clean the gravel more thoroughly than in previous years and to excavate and repair some of the perforated water supply pipes at the base of the gravel to ensure flow in all areas.

Commission staff collaborate with the Department of Fisheries and Oceans, as well as other agencies, in discussions and investigations concerning possible effects of industrial and other developments in the Fraser River system on sockeye and pink salmon production. Study of the proposed additional diversion from the Nechako River continued, and data was provided to Alcan's consultants investigating environmental concerns. This subject is discussed further in the introduction to the Annual Report. Proposals to dredge the pink salmon spawning areas on Harrison River and on the Fraser between the Vedder Canal and Hunter Creek as well as the navigation channel in the lower river are a continuing problem. Guidelines have been established by Canada Department of Fisheries and Oceans and operations are subject to continuous monitoring when necessary. The Commission assisted the Depart-

ment of Fisheries and Oceans in a prosecution under the Fisheries Act concerning removal of sand and gravel from the pink salmon spawning grounds in the lower Fraser River. Frequent meetings are held concerning provisions required for protection of sockeye and pink salmon when the watersheds of important spawning streams are logged. Logging plans in the Nadina River watershed were reviewed by the Commisssion in collaboration with the Canada Department of Fisheries and Oceans and the B.C. Forest Service and recommendations were made to minimize adverse effects on the spawning grounds in the Nadina River. To protect the Lillooet-Birkenhead sockeye population, joint meetings were held with a number of resource agencies concerning a land use study on the upper part of Lillooet River watershed and a program of river excavation and dyke building on both Lillooet and Birkenhead Rivers. Commission staff worked with several agencies including Fisheries and Oceans, Environmental Protection Service and B.C. Fish and Wildlife Branch to ensure that a sulphur spill at the upper end of the Birkenhead River sockeye spawning ground was adequately cleaned up. The spill was caused by a derailment on the B.C. Railway.

The B.C. government prepared plans for construction of setback dykes on the Vedder River below Vedder Crossing and made substantial progress in acquiring the lands for this work. Construction of the dykes, which will reduce the need for instream dredging, was started in 1979. No instream dredging was done in 1979.

Through cooperative arrangement with the Department of Fisheries and Oceans and Environmental Protection Service, applications for placer mining leases, water licences, dredging, gravel removal and construction on waterways were reviewed, and recommendations for protection of sockeye and pink salmon were made.

TABLE I

SOCKEYE CATCH BY GEAR

Gear		1967	1971	1975	1979
United States Convention Waters					
Purse Seines	Units	290	182	232	184
	Catch	1,387,370	1,607,117	896,416	942,566
	Percent	66.45	57.07	57.32	53.08
Gill Nets	Units	507	650	902	1,133
	Catch	595,580	1,016,984	615,790	779,807
	Percent	28.53	36.11	39.38	43.91
Reef Nets	Units	46	48	65	56
	Catch	104,694	191,682	51,096	52,201
	Percent	5.01	6.81	3.27	2.94
Troll	Catch	182	346	549	1,302
	Percent	0.01	0.01	0.03	0.07
TOTAL CATCH		2,087,826	2,816,129	1,563,851	1,775,876
Canadian Convention Waters					
Purse Seines	Units	102	173	116	142
	Catch	602,495	1,233,531	43,201	291,859
	Percent	32.12	39.61	6.71	18.01
Gill Nets	Units	1,767	1,357	842	835
	Catch	1,111,186	1,689,607	550,783	1,111,288
	Percent	59.25	54.25	85.46	68.59
Troll	Catch	161,801	191,160	50,489	217,118
	Percent	8.63	6.14	7.83	13.40
TOTAL CATCH		1,875,482	3,114,298	644,473	1,620,265

NOTE: Gear counts represent the maximum number of units delivering sockeye on a single day near the peak of the run.

TABLE II

CYCLIC LANDINGS OF SOCKEYE FROM CONVENTION WATERS

	United States	*Canada*	*Total*
1979			
Total Landings (No. Sockeye)	1,775,876	1,620,265	3,396,141
Share in Fish	52.29%	47.71%	
1946-1979			
Total Landings (No. Sockeye)	57,045,021	55,869,866	112,914,887
Share in Fish	50.52%	49.48%	
1979 *Cycle Catch*			
1979	1,775,876	1,620,265	3,396,141
1975	1,563,851	644,473	2,208,324
1971	2,816,129	3,114,298	5,930,427
1967	2,087,826	1,875,482	3,963,308
1963	1,314,045	686,681	2,000,726
1959	1,810,738	1,581,883	3,392,621
1955	1,006,610	1,108,081	2,114,691
1951	1,136,795	1,288,162	2,424,957
1947	88,220	355,035	443,255
1943	242,077	349,011	591,088
1939	555,233	568,943	1,124,176
1935	615,502	825,508	1,441,010
1931	975,591	458,048	1,433,639
1927	1,069,557	713,930	1,783,487
1923	495,490	361,463	856,953
1919	778,669	470,199	1,248,868
1915	736,939	1,088,524	1,825,463
1911	1,447,919	730,714	2,178,633
1907	1,030,359	691,210	1,721,569
1903	1,911,127	2,341,492	4,252,619

TABLE III

DAILY CATCH OF SOCKEYE, 1967-1971-1975-1979 FROM UNITED STATES CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1967	**1971**	**1975**	**1979**	**1967**	**1971**	**1975**	**1979**	**1967**	**1971**	**1975**	**1979**
1		1,068			83,010	9,704			17,852	79,685		
2					94,322	145,517				60,079	12,595	
3						94,802				87,853		2,009
4						53,159				56,222		38
5		12,708						162,300	11,025	1,411		
6		8,111			5,594			570,259	11,025	87,582		
7		9,281	72,530		88,268			231,876	6,254	69,145		
8		4,588	27,405		58,194	7,447				33,948	866	
9	251		20,843			155,896					683	
10	4,465					88,141						
11	3,762	1,714				58,076	194,558		2,548			
12		20,210				39,934	124,550		7,379			
13		17,672			152,217			39,498	4,728			
14		15,708	31,499		115,530	4,037	111,121	76,602	1,982	281	249	
15		9,213	12,561		104,995	109,435		33,180		4,431	152	
16	1,145			12,889	64,753	113,464				3,305	113	703
17	16,742			2,341		104,877				1,891		1,064
18	12,781	6,773		3,987		108,613	99,033		2,631			35
19		56,405				76,550	80,684	4,354	604	175		10
20		45,037				50,385	42,852	62,270	515	1,163		
21		37,835	103,060		189,061	547		66,914	198	980		
22			73,338	29,307	197,978	112,368		4,586		594		
23	5,072			166,862	156,371	93,858		32,736			139	
24	103,996			24,654	108,378	86,382		1,611			111	
25	74,382	16,459				55,063		1,195	11			
26	67,596	105,003				19,109	37,880	20,420	9	7		
27	54,405	72,329					18,493	13,936	6	396		
28		85,289	187,942					612		116		
29		89,638	122,179		41,810			7,179		64	18	
30	6,455		93,726	160,301	27,915	6,599		201		38	13	
31	146,028		91,233	40,500	31,254	94,802		89				
Totals	497,080	615,041	836,316	440,841	1,519,650	1,688,765	709,171	1,329,818	66,767	489,366	14,939	3,859
Troll	143	122	189	562	34	190	316	738		6	8	0
Monthly Totals	497,223	615,163	836,505	441,403	1,519,684	1,688,955	709,487	1,330,556	66,767	489,372	14,947	3,859
June, Oct. & Nov. Totals									4,152	22,639	2,912	58
Season Totals									2,087,826	2,816,129	1,563,851	1,775,876

TABLE IV

DAILY CATCH OF SOCKEYE, 1967-1971-1975-1979 FROM CANADIAN CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1967	**1971**	**1975**	**1979**	**1967**	**1971**	**1975**	**1979**	**1967**	**1971**	**1975**	**1979**
1		231			19,223	114,248				19,968	232	
2		Strike			16,577	189,823				34,675	28,563	
3		June 26 -				113,015			2,170	124,765		
4		July 10					50,455		29,490	16,483		9,256
5		953					40,096	456,514	27,699	20,106	11,838	
6		915			73,831			178,519	476	50,720	597	
7		850	36,951		184,860				639		454	
8		874			89,770				441	40,196	40,283	
9			8,136	34,395	114,059	288,641				46,210		
10						188,407	6,174			36,579		
11		39,111				198,973	4,731		55,886	32,316		
12		16,037					11,665	106,815	37,370	27,253		
13							10,241	57,850	793	3,514		
14			30,328		183,161			47,713	318	18,537	7,177	
15		12,044			129,684					18,225	223	
16				10,485	104,460	190,798		87,925			131	
17	10,864					87,209					43	323
18	8,744						25,011		650		12,914	856
19	6,984	21,756					9,082		371			
20		13,361					8,015	96,442	208	391		
21			26,256		115,565		7,752	9,430		167		
22			17,519		76,188	60,261	3,278	2,863	50,985	16,238	6,173	
23				43,593	36,132	86,106		19,211		7,811	66	
24	47,625		Strike			16,933						
25	21,971		July 25 -				40,306	8,000	234		3,254	
26	27,672	187,654	Aug. 24			142,151	18,025	5,021	115	22,579		
27	26,691	40,513				100,315	2,516	62,022	108	2,315		
28		18,266	25,123		66,008							
29			13,201		24,586					6,281	3,378	
30				156,952	5,799	173,063		1,498		2,812	13	
31	92,491				4,370	54,019						
Totals	243,042	352,565	157,514	245,425	1,244,273	2,003,962	237,347	1,139,823	207,953	548,141	115,339	10,435
Troll	32,565	21,857	2,145	55,795	125,490	166,518	41,800	160,891	3,470	2,460	6,337	218
Spring Salmon Gill Nets	1,142	617								4,786	3,571	
Monthly Totals	276,749	375,039	159,659	301,220	1,369,763	2,170,480	279,147	1,300,714	211,423	555,387	125,247	10,653
June, Oct. & Nov. Totals									17,547	13,392	80,420	7,678
Season Totals									1,875,482	3,114,298	644,473	1,620,265

TABLE V

INDIAN CATCH OF SOCKEYE BY DISTRICT AND AREA, 1975 AND 1979

	1975		1979	
District and Area	*Catch*	*No. of Fishermen**	*Catch*	*No. of Fishermen**
HARRISON-BIRKENHEAD				
Birkenhead River and Lillooet Lake	6,450	1**	14,000	1**
TOTALS	6,450	1	14,000	1
LOWER FRASER				
Below Hope	73,342	420	100,642	579
TOTALS	73,342	420	100,642	579
MIDDLE FRASER				
Hope to Lytton	72,929	1,191	61,661	1,326
Lytton to Churn Creek	44,575		54,521	
TOTALS	117,504	1,191	116,182	1,326
CHILCOTIN				
Farwell Canyon to Siwash Bridge	18,769	147	19,281	102
Keighley Holes	5,412		1,645	
TOTALS	24,181	147	20,926	102
UPPER FRASER				
Churn Creek to Quesnel	10,375	149	4,618	218
Shelley	700	28	750	24
TOTALS	11,075	177	5,368	242
NECHAKO				
Nautley and Stella Reserve	6,603	52	21,294	84
TOTALS	6,603	52	21,294	84
STUART				
Fort St. James-Pinchi Village	2,349	31	5,459	50
Tachie, Takla and Trembleur Villages	4,122	70	4,173	110
TOTALS	6,471	101	9,632	160
THOMPSON				
Main Thompson	7,050	151	2,300	161
North Thompson	CLOSURE			
South Thompson	505	187		
TOTALS	7,555	338	2,300	161
GRAND TOTALS	253,181	2,426	290,344	2,654

*Number of permits issued to Indians in district.
The Indian catch statistics detailed above are obtained from the Canada Department of Fisheries and Oceans. There officers control the taking of sockeye by the Indian populations residing throughout the Fraser River watershed.
**One permit issued for entire Band, the permit is not included in grand total.

TABLE VI

SUMMARY OF THE SOCKEYE ESCAPEMENT TO THE FRASER RIVER SPAWNING AREAS, 1967, 1971, 1975, 1979

District and Streams	*1979 Period of Peak Spawning*	Estimated Number of Sockeye					*Sex Ratio*	
		1967*	1971*	1975*	1979	Jacks	Males 4-5 Yr.	Females 4-5 Yr.
LOWER FRASER								
Cultus Lake	Nov. 29-Dec. 5	33,492	9,145	11,478	32,045	14	11,736	20,295
Upper Pitt River	Sept. 14-16	10,300	15,469	39,942	37,558	16	15,877	21,665
Widgeon Slough	Oct. 31-Nov.3	1,006	394	936	599	0	225	374
HARRISON								
Big Silver Creek	Sept. 21-23	0	0	31	119	26	33	60
Harrison River	Nov. 23-27	20,577	3,790	5,987	45,706	91	25,349	20,266
Weaver Creek	Oct. 27-Nov. 2	19,730	2,887	12,195	28,515	4,087	9,596	14,832
Weaver Channel	Oct. 28-31	2,887	2,736	19,816	22,888	2,290	9,174	11,424
LILLOOET								
Birkenhead River	Sept. 24-29	58,036	32,672	92,928	78,088	17,100	21,712	39,276
SETON-ANDERSON								
Gates Creek	Aug. 30-Sept. 2	1,665	797	788	907	335	165	407
Gates Channel	Aug. 29-Sept. 2	–	1,502	3,768	4,118	862	997	2,259
Portage Creek	Nov. 6-8	4,048	281	3,829	3,663	88	1,539	2,036
SOUTH THOMPSON								
Seymour River	Aug. 28-Sept. 5	13,361	19,028	37,024	49,321	15	23,834	25,472
Upper Adams River	–	–	0	23	0	0	0	0
Lower Adams River	Oct. 17-20	755,238	280,176	148,187	275,616	233	121,599	153,784
Little River	Oct. 20-25	74,490	2,821	7,268	10,443	33	6,111	4,299
South Thompson River	Oct. 20-25	270	10	16	144	0	64	80
Lower Shuswap River	Oct. 13-15	5,951	6,117	11,652	10,092	44	4,598	5,450
Misc. Late Runs	Oct. 17-Nov. 1	9,981	1,169	1,442	3,418	0	1,509	1,909
NORTH THOMPSON								
Raft River	Sept. 2-6	1,303	840	2,664	1,708	22	931	827
Barriere River	–	16	5	0	0	0	0	0
Fennell Creek	Aug. 26-31	920	1,300	4,127	15,590	25	7,050	8,515
North Thompson River	–	–	888	123	1,009	0	458	551
CHILCOTIN								
Chilko River	Sept. 16-20	176,337	161,943	220,554	240,294	5,370	80,701	154,223
Chilko Lake South End	Early Sept.	–	12,323	55,144	32,400	8,933	10,000	13,467
Taseko Lake	Aug. 29-Sept. 2	5,700	10,500	4,394	–	–	–	–
QUESNEL								
Horsefly River	Sept. 12-15	119	171	101	511	0	243	268
Upper McKinley River	–	–	–	100	0	0	0	0
NECHAKO								
Endako River	Sept. 6-8	949	284	192	1,294	9	655	630
Nadina River (Early)	Sept. 9-12	1,595	1,222	481	1,809	0	931	878
(Late)	Sept. 24-27	7,790	14,525	4,013	14,474	0	4,784	9,690
Nadina Channel (Late)	Sept. 22-27	–	–	11,306	41,212	5	18,393	22,184
Nithi River	Aug. 15-16	1,688	1,796	1,144	1,300	0	619	681
Ormonde Creek	–	0	0	0	0	0	0	0
Stellako River	Sept. 29-Oct. 3	91,525	39,726	176,079	290,116	74	125,904	164,138
STUART								
Early Runs								
Driftwood River	Aug. 6-8	52	335	20	247	0	118	129
Forfar Creek	July 31-Aug. 1	4,815	25,178	6,818	15,805	0	7,558	8,247
Gluske Creek	Aug. 2-3	1,368	14,305	10,370	10,040	0	4,780	5,239
Kynoch Creek	Aug. 1-2	6,694	22,932	25,124	34,228	5	16,365	17,858
Narrows Creek	Aug. 1-2	454	3,467	1,704	1,575	0	750	825
Rossette Creek	July 30-Aug. 1	6,566	16,445	8,543	15,893	12	7,594	8,287
Misc. Streams	Aug. 1-Sept. 4	1,120	13,271	13,188	14,975	0	7,137	7,838
Early Stuart Totals		(21,069)	(95,942)	(65,767)	(92,763)	(17)	(44,323)	(48,423)
Late Runs								
Kazchek Creek	Sept. 20-25	92	40	–	100	0	48	52
Middle River	Sept. 20-25	972	873	6,704	18,111	0	8,628	9,483
Tachie River	Sept. 24-25	576	360	7,525	10,940	0	5,212	5,728
Late Stuart Totals		(1,642)	(1,535)	(14,229)	(31,918)	(0)	(15,207)	(16,711)
NORTHEAST								
Upper Bowron River	Aug. 28-Sept. 5	31,695	25,497	29,700	35,000	0	16,674	18,326
TOTALS**		1,353,640	747,523	990,716	1,407,828	39,689	582,510	785,629

*Numbers for some populations have been revised from the respective Annual Reports.
**Totals include small numbers of fish in small tributaries not listed in the table

TABLE VII

DAILY CATCH OF SOCKEYE, 1964-1968-1972-1976 FROM UNITED STATES CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1964	1968	1972	1976	1964	1968	1972	1976	1964	1968	1972	1976
1						95,135	104,974		378			
2		749					78,450		377	3,109		
3		223			79,585		57,077	188,368		2,239		
4		24			73,612		229	107,849		1,796	106	
5					59,668	3,291				1,076	213	
6						69,286					190	
7						68,089	96				52	
8						50,987	26,887	312,686	163			754
9						57,251	264,096	220,219	152	772		235
10							100,648	112,490	83	702		407
11							67,670			146		
12						82,039				143		
13	3,118				25,336	24,597					53	381
14	1,463	28				3,519	3,632		314		6	50
15		2,662				357	28,126		28		5	91
16		4,530	1						104	46		
17		5,079	2,861		15,456				143	88		
18			2,990		12,122					83	35	
19			4,696	92,800	5,160	12,075				59	24	
20	6,956			50,093		9,103	2,809					96
21	8,672	2,170				3,314	23,404		50			21
22	16,773	44,615				35	17,222		49			3
23		40,911	6,394				252		61	108		2
24		39,630	58,086		5,773				13	24		
25		44,582	44,344		1,845					14	31	
26			53,366	152,359	1,205	3,182				10	89	
27	79,632		50,708	82,055		4,458					879	
28	54,204					2,172	137		22		211	1
29	53,412	15,711				33	65		6			1
30		96,552	7,840				55		4	20		
31		86,860	116,110		681							
Totals	224,230	384,326	347,396	377,307	280,443	488,923	775,829	941,612	1,967	10,435	1,894	2,042
Troll	165	90	111	332	113	66	182	98				
Monthly Totals	224,395	384,416	347,507	377,639	250,556	488,989	776,011	941,710	1,967	10,435	1,894	2,042
June, Oct. & Nov. Totals									1,169	2,030	2,780	647
Season Totals									508,087	885,870	1,128,192	1,322,038

TABLE VIII

DAILY CATCH OF SOCKEYE, 1964-1968-1972-1976 FROM CANADIAN CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1964	**1968**	**1972**	**1976**	**1964**	**1968**	**1972**	**1976**	**1964**	**1968**	**1972**	**1976**
1	CLOSED	875	CLOSED				108,624		1,684			26,461
2		1,761					66,001	114,159	103	1,823		34,117
3		2,481			114,881			331,770		5,017		
4					42,299					655	185	
5					22,772	233,366				584	5,783	
6						57,248					35	
7							217,308		2,491			51,294
8							76,235		664			12,709
9							84,294	101,107	23	748		
10								84,325		3,800		
11										206	2,184	
12					102,832	88,114	38,626					
13	2,441				28,793	25,694	153,479					3,512
14						2,774	15,165		9			
15		3,565				83,013			9			
16		2,078						32,817		39		
17			4,546		35,135			18,006		2,360		
18			4,142		15,025			54,068		13	8,694	
19				19,499	5,341	49,457						
20	6,922			11,614		4,318						1,806
21	8,331					3,426	49,742		1,393			
22		29,390					15,006					
23		24,249					3,317	58,676	1	1,614		
24			76,873		20,527			5,154	1	610		
25			71,895		7,093		13,362	23,660	3			
26				165,363	953	698		17,274				
27	49,543			124,928		518						
28	13,561					10,970	22,240					
29	12,826	160,129					1,531					
30		44,117					617	30,411		2,269		
31		28,164			4,927		5,376	486				
Totals	96,624	296,809	157,456	321,404	400,578	559,596	870,923	871,913	6,381	19,738	16,881	129,899
Troll	1,775	25,627	7,005	13,101	1,637	10,841	7,540	20,357	15	107	627	2,781
Spring Salmon Gill Nets	675	268	768	282					565		1,999	3,557
Monthly Totals	96,074	322,704	165,229	334,787	402,215	570,437	878,463	892,270	6,961	19,845	19,507	136,237
June, Oct. & Nov. Totals									9,298	7,106	18,018	19,190
Season Totals									514,548	920,092	1,081,217	1,382,484

TABLE IX

SUMMARY OF THE SOCKEYE ESCAPEMENT TO THE FRASER RIVER SPAWNING AREAS, 1964, 1968, 1972, 1976

District and Streams	1976 Period of Peak Spawning	Estimated Number of Sockeye			
		1964*	1968*	1972*	1976*
LOWER FRASER					
Cultus Lake	Nov. 15-20	11,143	25,736	10,660	4,450
Upper Pitt River	Sept. 10-15	13,804	16,988	13,412	36,530
Widgeon Slough	Nov. 1-4	667	1,552	302	1,391
HARRISON					
Big Silver Creek	Sept. 14-16	3,926	1,090	2,552	1,642
Harrison river	Nov. 12-15	2,202	5,391	1,399	5,130
Weaver Creek	Nov. 6-10	1,370	2,606	15,505	22,867
Weaver Channel	Oct. 26-28	–	1,910	11,043	28,211
LILLOOET					
Birkenhead River	Sept. 23-28	69,939	83,750	113,097	108,121
SETON-ANDERSON					
Gates Creek	Aug. 25-31	19,971	4,005	1,762	2,889
Gates Channel	Aug. 27-Sept. 2	–	6,284	6,807	14,855
Portage Creek	Nov. 5-8	9	173	1,460	3,800
SOUTH THOMPSON					
Seymour River	Sept. 3-5	2,784	3,957	2,889	8,489
Lower Adams River	Oct. 20-22	716	3,983	4,325	5,013
Little River	Oct. 20-25	0	0	81	175
Scotch Creek	Sept. 3-5	0	126	47	41
Upper Adams River	Sept. 3-5	162	–	31	40
Momich-Cayenne Creek	Sept. 2-5	823	617	1,003	1,998
NORTH THOMPSON					
Raft River	Sept. 3-7	5,201	8,121	11,151	8,684
Barriere River	Sept. 8	85	275	94	85
Fennell Creek	Aug. 30-31	146	954	1,931	4,090
North Thompson River	Sept. 25-30	38	–	465	500
CHILCOTIN					
Chilko River	Sept. 22-29	238,601	414,446	564,465	364,311
Chilko Lake-South End	Sept. 18-22	Present	Present	2,132	23,156
Taseko Lake	–	433	–	2,287	634
QUESNEL					
Horsefly-McKinley Creek	Sept. 15-20	15,315	5,686	3,385	2,064
Mitchell River	Sept. 15-20	169	4	85	101
Little Horsefly River	Sept. 25-30	217	73	18	32
NECHAKO					
Endako River	Aug. 30-31	7	18	27	40
Nadina River (Early)	Aug. 27	1,397	902	827	101
(Late)	Sept. 25-28	232	1,496	2,702	279
Nadina Channel	Sept. 18-22	–	–	–	1,394
Nithi River	–	13	20	58	0
Ormonde Creek	Aug. 30-31	180	81	54	30
Stellako River	Sept. 29-Oct. 3	31,047	30,420	36,771	150,741
STUART					
Early Runs					
Forfar Creek	Aug. 10-14	27	149	835	1,249
Gluske Creek	Aug. 9-13	218	18	591	966
Kynoch Creek	Aug. 9-13	1,147	833	2,534	6,727
Narrows Creek	Aug. 9-11	22	41	104	244
Rossette Creek	Aug. 9-13	952	518	834	2,090
Takla Streams	Aug. 9-13	37	0	143	1,120
Misc. Streams	Aug. 9-13	18	28	15	252
Early Stuart Totals		(2,421)	(1,587)	(5,086)	(12,648)
Late Runs					
Kazchek Creek	Sept. 23	0	33	65	33
Middle River	Sept. 23	743	288	972	330
Tachie River	Sept. 23	1,157	149	7,527	2,637
Late Stuart Totals		(1,900)	(470)	(8,704)	(3,000)
NORTHEAST					
Upper Bowron River	Sept. 4-6	1,500	3,634	4,138	2,250
TOTALS**		426,459	626,706	830,128	823,453

*Numbers for some populations have been revised from the respective Annual Reports.
**Totals include small numbers of fish in small tributaries not listed in the table.

TABLE X

PINK SALMON CATCH BY GEAR

Gear		1973	1975	1977	1979
United States Convention Waters					
Purse Seines	Units	268	263	266	327
	Catch	1,785,699	978,042	1,777,767	3,354,044
	Percent	80.26	78.04	81.98	82.89
Gill Nets	Units	624	902	907	768
	Catch	323,370	196,726	197,178	388,723
	Percent	14.53	15.70	9.09	9.61
Reef Nets	Units	53	56	53	52
	Catch	101,729	55,223	30,069	42,771
	Percent	4.57	4.41	1.39	1.06
Troll	Catch	14,126	23,164	163,416	260,735
	Percent	0.64	1.85	7.54	6.44
TOTAL CATCH		2,224,924	1,253,155	2,168,430	4,046,273
Canadian Convention Waters					
Purse Seines	Units	137	116	111	184
	Catch	1,246,204	639,026	807,194	2,480,864
	Percent	60.48	50.88	38.89	60.05
Gill Nets	Units	995	926	913	661
	Catch	395,901	376,511	280,674	103,738
	Percent	19.21	29.98	13.52	2.51
Troll	Catch	418,574	240,353	987,610	1,546,753
	Percent	20.31	19.14	47.59	37.44
TOTAL CATCH		2,060,679	1,255,890	2,075,478	4,131,355

Note: Gear counts represent the maximum number of units delivering pinks on a single day near the peak of the run

TABLE XI

CYCLIC LANDINGS OF PINK SALMON FROM CONVENTION WATERS

	United States	*Canada*	*Total*
1979			
Total Landings (No. of Pinks)	4,046,273	4,131,355	8,177,628
Share in Fish	49.48%	50.52%	
1957-1979			
Total Landings	27,534,827	26,937,675	54,472,502
Share in Fish	50.55%	49.45%	
1979 *Catch*	4,046,273	4,131,355	8,177,628
1977	2,168,430	2,075,478	4,243,908
1975	1,253,155	1,255,890	2,509,045
1973	2,224,942	2,060,679	4,285,603
1971	2,371,151	2,137,337	4,508,488
1969	945,797	861,505	1,807,302
1967	3,827,040	4,156,922	7,983,962
1965	558,380	592,467	1,150,847
1963	4,426,232	4,173,288	8,599,520
1961	508,544	545,128	1,053,672
1959	2,427,535	2,312,906	4,740,441
1957	2,777,366	2,634,720	5,412,086
1955	4,685,984	4,129,063	8,815,047
1953	4,951,429	4,142,117	9,093,546
1951	5,086,284	2,885,514	7,971,798
1949	6,235,400	3,189,662	9,425,062
1947	8,801,595	3,491,416	12,293,011
1945	5,458,890	1,279,849	6,738,739

TABLE XII

DAILY CATCH OF PINK SALMON, 1973-1975-1977-1979 FROM UNITED STATES CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1973	1975	1977	1979	1973	1975	1977	1979	1973	1975	1977	1979
1					4,907		1,040		360,059		17,172	
2	100								330,814	280,698		
3	140								206,254			306,247
4	152										1,641	59,389
5			220					14,791			152,848	
6			203				854	33,009			10,868	
7		307	71				8,841	34,056				
8		308	189		14,294		109			53,910		
9	1,067	324					8,300		294,472	32,018		
10	1,496						644		169,530			
11	2,615					19,933			66,887			
12	3,581					16,127						
13	3,818							42,539			219	
14		1,066			22,253	23,762	1,796	132,837		146,806		
15		840			15,311		46,828	113,410		132,744		
16	5,661		1,776	4,266			70,333			57,264	5,344	12,762
17	3,799		409	925					59,485		55	70,785
18	2,908			1,608		55,608			21,161			3,790
19						52,909		7,602			36	1,620
20					62,583	53,815		476,678			2,042	
21		8,328			59,992		23,559	478,797			1,623	
22		5,047		5,203	43,693		446,813	95,190			995	
23	6,729			13,237	20,293		246,590	345,863		12,387		
24	5,110		2,163	8,198			275,569	60,371	6,891	4,707		
25	4,251		4,015				21,322	28,794	3,242			
26			1,363			137,643	20,728	548,344			743	
27					249,269	91,649		457,938			780	
28		12,707			138,583			35,947			243	
29		8,891					9,689	347,355		2,431		
30	6,821	7,998	422	12,529			360,684	15,619		866		
31	5,114	8,130	4,657	3,019			250,303	12,722				
Totals	53,362	53,946	15,488	48,985	631,178	451,446	1,794,002	3,281,862	1,518,795	723,831	194,609	454,593
Troll	7,108	7,881	40,202	34,918	5,704	11,946	118,162	224,700	598	956	4,394	2
Monthly Totals	60,470	61,827	55,690	83,903	636,882	463,392	1,912,164	3,506,562	1,519,393	724,787	199,003	454,595
June, Oct. & Nov. Totals									8,179	3,149	1,573	1,213
Season Totals									2,224,924	1,253,155	2,168,430	4,046,273

TABLE XIII

DAILY CATCH OF PINK SALMON, 1973-1975-1977-1979 FROM CANADIAN CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1973	1975	1977	1979	1973	1975	1977	1979	1973	1975	1977	1979
1					3,396		12,490		167,083	33,756	50,134	
2					3,452		5,713		157,615	61,793		
3									157,578			
4	1		75			470						49,036
5						199				78,851	30,598	
6	Strike				24,136		1,433	75,235		74,730	108,270	
7	July 6-	50			14,643		23,843	499		50,627		
8	July 15				133,373		20,702			58,485	69,472	
9		11		66	2,572	186	24,390		39,434			
10					1,481	70	693		50,859			
11						165			36,599			
12						121		1,547	27,396		28,051	
13			172		23,520			119,176			1,279	
14		18			24,987			155,509		62,355	44,759	
15	40				38,368		207,768			45,604		
16	90			165			116,168	2,886		33,961		
17	84								58,070	29,163		6,309
18	59					6,347			12,299	58,966		3,678
19						11,200			7,441		548	
20			173		79,374	9,559		317,597			126	
21		243	152		71,878	14,836		240,369			9,285	
22		130			125,369	9,634	37,831	98,272		45,221		
23	7,155			182	10,591		136,178	2,467		2,800		
24	5,601	Strike					55,838		31,267			
25	4,415	July 25-	4,633			96,884		623,102	1,191	10,910		
26		Aug. 24	120			85,765		384,563	34,996			
27		712			178,434	94,303		244,486				
28		382			131,738							
29					28,293		3,685			11,317		
30	2,963			175				257,934		508		
31	3,472						87,617					
Totals	23,880	1,546	5,325	588	775,605	329,739	734,349	2,523,642	781,828	659,047	342,522	59,023
Troll	93,200	72,114	274,529	129,511	248,042	56,040	604,639	1,297,321	52,393	99,598	45,067	35,543
Spring Salmon Gill Nets									7,305	14,358	3,527	
Monthly Totals	117,080	73,660	279,854	130,499	1,023,647	385,779	1,338,988	3,820,963	841,526	773,003	391,116	94,566
June, Oct. & Nov. Totals									78,426	23,448	65,520	85,327
Season Totals									2,060,679	1,255,890	2,075,478	4,131,355

TABLE XIV

SUMMARY OF THE PINK SALMON ESCAPEMENT TO THE FRASER RIVER SPAWNING AREAS

District and Streams	*1979 Period of Peak Spawning*	*Estimated Number of Pink Salmon*			
		1973	**1975**	**1977**	**1979**
EARLY RUNS					
LOWER FRASER					
Main Fraser	Oct. 4-11	766,053	315,049	775,016	1,521,856
FRASER CANYON					
Coquihalla River	Oct. 1-5	11,994	5,933	2,821	16,468
Jones Creek	Oct. 5-10	2,544	2,645	3,350	4,993
Misc. Tributaries	Sept. 27-Oct. 5	3,549	948	3,687	4,149
SETON ANDERSON					
Seton Creek	Oct. 12-15	181,027	209,734	341,256	549,512
Upper Seton Channel	Oct. 8-12	6,708	7,995	11,122	9,956
Lower Seton Channel	Oct. 8-12	23,602	23,874	37,163	34,494
Portage Creek	Oct. 7-10	13,983	28,454	19,904	51,842
Bridge River	Oct. 8-11	23,738	10,803	25,800	65,759
Gates Creek	Oct. 15-17	—	—	96	1,277
THOMPSON					
Thompson River and Tributaries	Oct. 4-17	283,385	480,350	972,941	885,402
TOTAL*		1,316,702	1,085,985	2,193,156	3,154,945
LATE RUNS					
HARRISON					
Harrison River	Oct. 15-20	196,150	180,052	126,782	269,858
Chehalis River	Oct. 12-16	14,300	2,356	2,613	2,067
Weaver Creek	Oct. 18-25	225	411	2,397	117
Weaver Channel	Oct. 15-18	640	1,201	963	737
CHILLIWACK-VEDDER					
Chilliwack-Vedder River	Oct. 12-20	210,799	81,137	48,561	124,041
Sweltzer Creek	Oct. 23-26	15,265	16,121	5,093	8,889
TOTAL*		437,409	281,278	186,409	405,709
GRAND TOTAL*		1,754,111	1,367,263	2,387,811	3,560,654

*Totals may include small numbers of fish in small tributaries not listed in the table.

TABLE XV

SUMMARY OF THE PINK SALMON ESCAPEMENTS TO UNITED STATES AND CANADIAN NON-FRASER RIVER SPAWNING AREAS*

United States Spawning Areas	1973	1975	1977	1979
Nooksack	75,000	36,000	25,000	31,400
Skagit	250,000	100,000	500,000	300,000
Stillaguamish	35,000	30,000	38,000	135,000
Snohomish	110,000	65,600	160,000	180,000
Puyallup	12,000	11,800	28,800	29,500
Dosewallips	25,000	5,500	16,800	17,400
Duckabush	18,000	4,500	12,300	16,200
Dungeness	47,000	24,500	35,500	50,000
Elwha	9,600	1,500	5,000	7,100
Miscellaneous	13,400	11,200	32,300	15,800
TOTALS	595,000	290,600	853,700	782,400

Canadian Non-Fraser Spawning Areas	1973	1975	1977	1979
Jervis Inlet	10,830	24,300	20,000	13,600
Howe Sound	135,500	105,500	2,000	4,700
Burrard Inlet	75,000	35,000	22,000	22,470
TOTALS	221,330	164,800	44,000	40,770

*These data were provided through the courtesy of the Washington State Department of Fisheries and the Canada Department of Fisheries and Oceans.

COMMISSION PUBLICATIONS, 1979

1. Annual Report of the Internation Pacific Salmon Fisheries Commission for 1978.

STAFF PUBLICATIONS IN OTHER JOURNALS

1. Indentifying extractives toxic to aquatic life. 1979. I. H. Rogers, H. Mahood, J. A. Servizi, R. Gordon. Pulp and Paper Canada, 80(9): T266-290. September.

2. Salmon Studies associated with potential Kemano II Hydroelectric development, Volume 2, Sockeye Salmon Studies on the Nechako River February 1979. International Pacific Salmon Fisheries Commission. B.C. Hydro and Power Authority Publisher. 99p.

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